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The Farmer's Digest

Volume 10 May, 1946 Number 1

The French Don't Dare Wear Out Their Farms

Condensed from Missouri Ruralist

Dr. William A. Albrecht
Chairman, Department of Soils—University of Missouri

THE request to teach soils to our American soldiers in the Biarritz-American University of France, brought with it opportunity to study the soils of France as the basis of an old agriculture.

Teaching soils was an international affair. It certainly was extensive in its geographic aspects, with a class in soils including students from 38 of the United States, France with her colonies, Great Britain with her outlying possessions and in fact, any people who could understand the English language. I would have been neglecting an excellent opportunity in this transplanted college of agriculture, if I had not taught most objectively by using the soils, crops, livestock and other agricultural objects right before us in France to illustrate the fundamental principles of the subject in the classroom.

In this older country and its older agriculture, one soon recognizes the adjustments of this means of livelihood to the soil as this determines the nature and magnitude of farming. These adjustments clearly demonstrate what is meant by saying "as one gets older he becomes more conservative." This old agriculture is very conservative. Conservation of soil fertility is easily recognized and forcefully imprints itself on one's mind.

Livestock plays a big part in putting back on the land much of the necessary chemical elements or fertility supplied by the soil. Farm animals have been doing much to return soil fertility to keep life over here going during the many past centuries.

In looking at France, and most any other of these older countries of Europe, our soldier boys have commonly made these comments: "The farmers of Europe seem terribly slow. Farming with oxen as power certainly doesn't consider time." "Those farmers cer-

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tainly put a lot of work into growing and harvesting their crops."

Then one also could hear the soldier-students say: "But they certainly love their animals, if one can judge by the way they care for them." "They certainly don't waste anything over here, not even the manure. The way they fuss with it makes it look as if it were something very valuable. Perhaps our own agriculture in the United States is heading rapidly toward this European kind of farming if we don't start practicing conservation of our soils and other resources more completely."

The sojourn and study by our own farm boys as soldiers in Europe predicts a wholesome future effect on our farming. It may be inducement for a shift from a highly exploitive system to one that is much more conservative. Our boys realize that the folks in this country who have learned to conserve have had the means by which to maintain themselves well into old age. The agriculture of this country, which the Romans called Gaul long before the Christian era, already has lasted 20 centuries because the conservative use of the land has left its soil with enough producing power to be a support for agriculture today. Families keep their land and pass it on down thru successive generations of their offspring. These folks keep the land; they keep the soil; and the soil in turn keeps them.

Livestock is an integral part of the farm living. It is not just a speculative aspect of the farming business. Cattle are not grown rapidly in large numbers and sent off to slaughter. This would mean a heavy drain on the soil fertility in terms of calcium and phosphorous in the bones. It would also draw heavily on the nitrogen in the soil needed to grow the muscle. Such high rates of fertility removal in the past would have been too highly exploitive for the soils to last so long.

The French farmer does not grow 10 head of cattle in one year, sell them off and forget the soil fertility he is throwing in with the bargain. He does not have what might be called 10 cow-years telescoped into one year. Rather, he grows and keeps one head 10 years.

In that practice one may well look for the necessity that compels it. It is a part of the balance, or the adjustment, of the agriculture by which the soil can continuously supply the fertility. French farmers dare not wear out their farms. Their country has no more new farms for them.

While the French farmer's 1 cow is putting out 10 single cow-year units by living 10 years, which we would get from 10 baby beeves in one year, she is occupying a prominent place as a

regular piece of farm equipment and as part of the very farm itself. She is serving as a triple-purpose animal. She is the farm power. She provides milk, tho perhaps not in daily quantities we might deem necessary. Eventually she is meat. In serving the last of these 3 purposes, one might see in her extended age some explanation as to why her carcass requires some mechanical aids at mastication. That's why it comes to the table largely in the form of sausage. We see why meat requires long cooking in water to end up in soup—which is the national dish introducing most dinners in France.

The mature cow is much more efficient as a conserver of soil fertility than the growing calf. The nitrogen, calcium, phosphorus, potassium and other fertility elements going into her as feed are only body replacements. Their equivalents are put out as urine and feces that represent a by-product with fertilizer possibilities coming along with her three-phased services.

The young animal hauls these nutrients off the farm. The mature cow serves mainly to rotate them there with a small loss while she is burning their organic combinations to provide power. That power represents air, water and sunshine concentrated into usable form by means of this soil fertility. The latter is not hauled off, but can go back via the manure into another cycle of oft-repeated services.

Conservation of the fertility has been the habit with these folks. It is not a new practice encouraged by recent special instructions and appropriations. One may then well raise the question whether any agriculture would have survived these many centuries if conservation of the soil fertility had not been its regular habit.

One needs only to see the French farmer's attention to the bedding and the manure to recognize conservation of soil fertility in practice. In areas where straw is not plentiful, he brings in bracken fern from the forests, reeds from the summer-dry swamps, and the lower parts of the cornstalks from the field. From the last of these, the tops, the lower leaves and the ears have already gone from the field as feed. But this coarse bedding would not readily soak up the urine, considered too valuable to be allowed to run thru and be lost. Consequently forest leaves are mixed in. Were the leaves used alone they would laminate to be so compact as to turn off the urine for its loss. But when mixed with the coarser materials in the proper proportions as learned from experience, they help to retain the urine while the tramping breaks the stalks and

opens them for its better absorption. Full well does the farmer know his bedding materials in terms of their soil fertility values, when he discriminates between the different kinds of forest leaves in telling you that one kind does or does not make good manure.

The French farmer truly "makes manure," and—quite unlike our own practice—does not just haul out for disposition what is a barn waste consisting of bedding and animal feces. For him such materials, as he takes them out of the barn, including the carefully conserved urine, are not manure as he speaks of it. They are merely the raw materials which he puts up carefully into a straight-sided flat-topped pile in order to let them go thru the heating process. This process is, for him, the making of the manure, which means production of an organic fertilizer. Perhaps he cannot give you the chemical and microbial techniques involved in the process, but he does not saturate the pile initially with water and bring on exclusion of the air. Instead, he uses the woody, carbonaceous bedding as the energy foods or fuels for the decay-promoting microbes, just as we feed starchy grains or carbohydrates as energy-foods for livestock. Just as we balance the grains with protein supplements, so the urine, carefully conserved, supplies the nitrogen as supplement to balance the carbon in the microbial diet from which the excess carbon is respired or burned by the growing microbes to the extent of heating the manure pile.

Soluble minerals come along with the nitrogen in the urine. They improve the diet of the bacteria that convert this original mixture of coarse bedding into a microbial product that serves well as a fertilizer for crops. Once the heating is finished, he keeps the manure pile nearly saturated with water to exclude the air and stop further respiration or the burning of this finished product. He may put it out in the field in regular rows of uniformly-sized piles in order that the reduced temperature may hold down the rate of its destruction, and from which he can distribute this fertilizer at uniform rates.

Altho the farmer of France may speak of this by-product of his power animals as manure that he has made, it can well be considered a fertilizer which he has manufactured from the barn wastes by proper microbial management. Strawy manure plowed under for a crop like corn—as some farmers have learned from costly experience — makes the crop yellow and of sickly appearance, or "burn it out" as is commonly said. The manure made into a fertilizer in the same sense as the European farmer makes it avoids this danger. Piled, as it

was, it has already burned out the surplus carbon while the rest of it was combined with the nitrogen and other solubles in the urine. He does not feed this extra woody material to the soil microbes. They are, therefore, not using the soil's supply of soluble nitrogen to balance the excessive carbon in their diet, and are not leaving the competing corn plant in that starved condition for nitrogen which is so often wrongly considered due to a shortage of water.

Instead, he plows under an organic matter from which the microbes must get energy, but in which there is carbon in a narrower ratio to the nitrogen than they normally use so that they set some nitrogen free for the plants instead of competing with the crop for this nutrient. We must admit than he knows his carbon-nitrogen ratio for his soil microbes just as we believe we know our nutritive ratios for putting feed thru our livestock. We must admit, also, that we can well extend our better understanding of the conservation of soil fertility in farm manures by studying the practices in these older countries.

Yes, the European farmer knows how to "make manure." His farm power coming by way of livestock also is a good exhibition of the practice of conservation of soil fertility developed to a high degree. This conservation is not only a matter of putting the chemical elements back into the soil as we would recognize them in the ash after the chemist's ignition and analyses. Instead they are going back in complex compounds of organic matter. These may be much more than just so many elements as we readily calculate them in recommending a formula for commercial fertilizers. They may be the plant hormones. They may be many other complexes of values yet unknown, but like vitamins tremendously important even if needed in only very small quantities.

The European farmer who still persists in making manure and thereby making his organic fertilizer, may be practicing a kind of conservation that is more far-reaching than those of us who are using our soil fertility so exploitively are likely to appreciate. In the United States our agriculture is still young. But yet, we already have abandoned and ruined by erosion extensive land areas. Are not those eye-sores reminding us that we must take to being more conservative of our soil fertility if we are to continue in agriculture; and that we must do so long before we get to the agricultural age of countries like France which we may—possibly derisively—consider "old and conservative?" Any one of us needs

not be very old in his own land-owning experience, nor see much of the farming in these older countries, to become conservative, too. At the same time we realize that others beside the livestock farmer must share soil conservation responsibilities.

More on "Corncob Beef"

Some additional feed lot evidence on the nutritive value of corncobs in fattening rations of beef cattle was released recently by the Ohio Agricultural Experiment Station. As reported on page 65 of *Successful Farming* for July, 1945, 100 pounds of corncobs replaced 62 pounds of ground shelled corn in the ration during the first two years of digestive comparisons. The third year of the test has brought more interesting facts to light.

Over a three-year period, a total of 74 head of steers were fed a ration of ground shelled corn, mixed hay, and two pounds of mineralized soybean-oil meal per head daily. Another 74 head received the same hay and supplement, but the corn was "diluted" with a "double shot" of cobs—double the amount found in ordinary ground ear corn.

The double-shot, cob-fed cattle gained slightly slower in the feed lot, and showed just a shade less fat covering when ready for market. Packer buyers appraised them as worth 15 cents a hundredweight less on the hoof than the steers fed all ground shelled corn, and they weighed 25 pounds less per head after a 238-day period.

Proof of the pudding, tho, is in these figures: feed cost per hundredweight of gain for the steers receiving ground shelled corn was $19.08. For the double-shot-cob steers, that cost was $16.64. Taking a 15-cent dock on the price to save $2.44 in feed cost is good business.

Tho each lot of cattle received the same amount of soybean-oil meal per day, the ground-shelled-corn lot used only 100.9 pounds of the supplement for each 100 pounds of gain, while the double-shot-cob steers needed 106.7 pounds of the protein feed. This indicates that the protein in the soybean-oil meal helped in the digestion of the extra cobs.

Would an increase in the supplement, then, cause the double-shot-cob fed steers to keep pace with the ground-shelled-corn animals in rate of gain and degree of fat covering? The experimenters don't have that answer yet, but advise, "Don't use double shots of cobs if you are going to be stingy with the protein."

—*Successful Farming*

Save Colostrum for Baby Calves

Condensed from The Jersey Bulletin

Prof. Howard Dickey
University of Vermont

THE importance of raising dairy calves can not be over emphasized. In order to maintain dairy cattle numbers five heifer calves must be raised each year from a herd of 20 cows. This looks like an easy task. However, if we assume that the herd of 20 head has an 80 per cent calf crop and 50 per cent of the calves are heifers, then we will have eight heifer calves from which to supply the necessary five heifers. Also if we wish to do any culling in our herd, it will be necessary to raise more than the five.

Since the calf is born with little or no vitamin A in the blood, colostrum milk should be provided, either by letting the calf nurse the dam or by milking the colostrum from the udder and feeding the calf 1.5 to 2 pounds of colostrum three times daily making a total of 4.5 to 6 pounds of colostrum daily for the first three days. Table I shows the total vitamin A potency of colostrum milk obtained from 28 cows representing the various dairy cattle breeds by Ohio Station workers.

Table I
The Vitamin A Potency of Colostrum Milk

Days after calving	Milk Produced lbs.	Vitamin A Output micrograms	Carotene Output micrograms	Total Vitamin A Potency micrograms
1st	22.4	25854	29583	55437
2nd	28.2	13806	15703	29509
3rd	32.7	9188	11242	20430
Total	83.3	48848	56528	105376

The dairy calf needs about 4,500 to 5,000 micrograms of B carotene per 100 pounds of body weight daily. Six pounds of the above colostrum would contain about 7,590 micrograms of total vitamin A potency which would more than supply the needs of the dairy calf. Six pounds of regular milk will supply about 3,200 micrograms of vitamin A and carotene, probably not enough to meet the calf's needs.

The milk (colostrum) produced during the first three days after freshening is not marketable and much of it is often wasted. Colostrum is highly nutritious, containing about twice as much milk solids as normal milk, much more protein and minerals and more

Reprinted by permission from The Jersey Bulletin, Indianapolis, Ind., Feb. 25, 1946

than twice as much carotene and vitamin A. The colostrum aids the calf to make the change from uterine nourishment obtained from the blood of the dam to a regular milk ration. Colostrum also acts as a mild laxative and aids the digestive tract to begin its normal function. The above table shows the average cow produces about 80 pounds of colostrum. This milk can be stored by freezing and holding in frozen condition until needed. Calves have been fed on stored colostrum at this station during the first 10 days and in some cases as long as nine weeks with good results. Neither scouring nor serious digestive upsets occurred.

A few simple precautions are necessary if stored colostrum is to be used as a substitute for normal milk in calf feeding. As soon as it is drawn from the udder it should be strained into the clean paper or metal containers in which it is to be frozen. The colostrum should be frozen in lots sufficient for only a single day's feed. If these are packed in sawdust on the north side of a building, their contents will remain solid through such brief thaws as often occur during the winter. Deep freeze units or lockers can be used in warmer weather.

Each container should be labelled as first, second, or third day colostrum, and in feeding, changes from one to the other should be avoided as far as possible since the composition of the colostrum alters profoundly from day to day, becoming more like that of normal milk and by the fourth day after calving being quite normal.

The colostrum should not be thawed until shortly before it is to be used and it should be kept cold until feeding time. It can be thawed by setting the can inside the barn a few hours before it is needed. Before feeding it should be warmed to about 100° F. and thoroughly mixed.

Every quart of colostrum used by older calves releases a quart of milk for sale. In view of present high prices and urgent needs, the dairyman who thus uses colostrum in the winter is likely to be well repaid for his trouble.

Another important point to consider is the method of feeding. The length of time to leave the calf with the dam is still controversial. However, if the calf and dam are both considered, it is probably best to remove the calf from the dam as soon as possible, so that we will know definitely the amount of milk which the calf obtains, and the cow's udder will not be so apt to be injured by the bunting of the calf. Controlling the amount of milk given the calf will help prevent overeating and resultant digestive disturbances. The calf can also

be taught more easily to drink or suck milk from a nipple placed on a sucker-bucket or large glass bottle, if the calf is removed from the dam after the first day.

Nipple Versus Bucket

The use of a nipple in place of ordinary pail feeding is definitely a modern trend in the right direction. It has long been known that the esophageal groove, the opening into the first and second stomach, should function to shunt the milk directly into the fourth, or true stomach where normal milk digestion begins in the case of the young calf. However, with ordinary pail feeding, some milk gets into the first and second stomachs, which do not function normally in the young calf. This milk would sour and ferment and produce toxic products which irritate the digestive tract and probably induce calf scours and other digestive upsets. South Carolina workers showed by using sucker-buckets and placing them above the calf's head that little or no milk passed into the first and second stomachs, because the esophagael groove functioned properly when the calf's head and neck were raised upward while drinking, thus shunting the milk into the fourth stomach. There is probably another factor operating, and that is that the calf does not swallow as much milk, nor swallow as rapidly, when its head is tilted upward and thus less milk is present at the esophageal groove at any given time to spurt through into the first and second stomachs. Thus the esophageal groove can handle the milk satisfactorily and normal digestion will take place in the fourth stomach.

Another rather modern development is the use of the raised platform and heavy grating for the calves to stand and rest on. At the University Farm we are using the raised platform with very good results. We are finding that the calves keep cleaner, they are removed from the cold floor, the bedding remains drier because the urine runs through the grating onto the floor, and since the bedding remains cleaner, the calves do not have as great a chance to pick up and eat dirty bedding. We have an added feature in that we tie the calves in a row along one side of the raised platform and have a partial board partition between them which prevents the calves from sucking or licking each other. This lessens the transmission of disease and prevents the development of hairballs in the calf's stomach.

Sanitation in keeping the calves' surroundings clean and in washing the pails or bottle in which the calves are fed are important. Too many of us are prone to rinse out the calf pails and turn them bottom side up

until the next feeding. During fly season flies are attracted which results in serious contamination of the feeding utensils. At any season of the year, the calf feeding equipment should be rinsed and then washed and sanitized as thoroughly as any of the milking equipment.

In feeding and caring for the dairy calf it is necessary to remember that most of our calves that are lost die during the first six weeks of their life. For this reason it will pay dividends for us to take special precautions during this relatively short period. We should weigh the milk or have some other accurate measure of the amount of milk the calf receives each feeding. The milk should be warmed to 100° F. before feeding. If necessary, a thermometer should be used since our hands are not accurate measures of temperature.

The feeding schedule for feeding dairy calves has undergone much change during the past few years. We are now recommending that the calf be fed a minimum amount of whole milk with the main emphasis upon getting it to eat calf starters and hay at an early age. The Table II feeding schedules are being used satisfactorily in Maryland and New York.

As you will note the calf is allowed to remain with the dam during the first day after birth. It is then removed from the dam and fed milk produced by the dam during the remainder of the first week. The amount of milk fed daily remains low. We get best results by feeding the milk three times daily during the first week of age. Especially is this true in the case of undersized or weak calves.

Table II

Daily Feeding Schedule for Jersey Calves Lbs. Whole Dry Calf

Age of Calf	Milk	Starter	Hay
1st day	With dam		
2-7 days	5*		
2nd week	6	⅛	
3rd week	7	¼	Free Access
4th week	7	½	Free Access
5th week	6	1	Free Access
6th week	6	1½	Free Access
7th week	5	1½	Free Access
8th week	4	2	Free Access
9th week	3	2½	Free Access
10th week	3	3	Free Access
11th-14th week		3½–4	Free Access
	Grain		
15th-16th week	0–4	4–0	Free Access
16th-24th week	4		Free Access

*Colostrum and milk from calf's dam.

At the beginning of the second week of age the calf is offered calf starter, a dry grain mixture containing palatable grains and dried skim milk. The following formula is used at our dairy experiment barn:

300 lbs. yellow corn meal, 300 lbs. ground oats, 300 lbs. wheat bran, 100 lbs. linseed oil meal, 333 lbs. dried skim milk.

Cornell is now recommending the two following calf starters:

	I Lbs.	II Lbs.
Ground Yellow Corn	29	26.25
Rolled Oats	25	28
Wheat Bran	10	10
Linseed Meal	5	5
White Fish Meal	3	3
Dried Skim Milk	20	10
Dried Brewer's Yeast	6.25	
Cereal Yeast Feed		16
Steamed Bone Meal	.50	.50
Ground Limestone	.50	.50
Salt	.50	.50
Cod Liver Oil Concentrate	.25	.25
Percent Total Protein	22.4	19.4

All of these calf starters give good results. However, the calf must be taught to eat the starter by placing some in its mouth a few times each day during the first few days. The starter should be kept before the calf at all times. Water should be offered frequently, or placed before the calf at all times.

At the beginning of the third week the calf should have free access to hay. This hay must be the finest stemmed, leafiest, highest quality hay which you have in your barn. There is no other feed which will take the place of high quality hay for the dairy calf.

For larger calves, the milk ration should be cut slightly during the fourth and for smaller calves during the fifth week. The reason for the decrease is to enable the calf to eat more calf starter and slightly more hay. A gradual decrease is made in the amount of milk fed until the calf is eating nearly three pounds of starter daily. At this time the milk is discontinued. Weaning from milk should be completed at approximately 70 days for the Jersey breed.

It is also a wise practice to weigh your calves or measure them with a tape, which gives the approximate weight of the calf. This can be done once each month and the results can be compared with the weight chart so that you can determine whether your calves are above or below normal for the breed.

Normal weights of Jersey calves: At birth, 55 lbs.; at 1 month, 76 lbs.; at 2 months, 105 lbs.; at 3 months, 140 lbs.; at 4 months, 174 lbs.; at 5 months, 222 lbs.; at 6 months, 260 lbs.; at 12 months, 456 lbs.; at 18 months, 572 lbs.

Factors That Affect Poultry Profits

Condensed from Everybodys Poultry Magazine

L. B. Darrah and J. H. Bruckner

POULTRY farming has come a long way during the past 40 years. As with other types of farming, it has become more and more commercialized. By that we mean that the business has shifted from small farm flocks which are cared for mostly by the housewife and children to large flocks which require the full-time of the operator and, in many cases, other help.

In this shift the poultry industry has moved to the place where success in poultry farming depends upon producing and marketing a large quantity of eggs and poultry meat during the year.

Poultry farming is a business—and sound business principles must be followed in establishing and in operating a successful farm business.

There are many ways of measuring the success with which a poultry farm is operated. Some measure the profitableness of their business by looking at the balance in their bank account periodically; others keep records of cash receipts and expenses, while others keep detailed costs and returns.

Of the many measures of profits in farming, the term labor income is perhaps the most useful one. Labor income is what the farmer gets for his year's work after having paid all expenses and deducted a charge for the use of the capital invested in the farm business.

In addition to labor income, a poultryman has a house in which to live, a garden, milk, eggs, poultry meat, and other products which are furnished by the farm.

In 1941, the average labor income on 120 commercial poultry farms in New York State was $1,600, or about $1.40 per hen. This was a good year. Although one out of every seven farms made more than a $3,000 labor income, one out of every five made less than $500.

In 1933, a very poor year, the average labor income on 122 commercial poultry farms was $525 or about 40 cents per hen. The labor income on about one-half of these farms was less than $500. Only seven farms had a labor income of more than $2,000.

Studies of poultrymen's incomes in Connecticut show that

Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pa., Mar., 1946

the average income in 1933 was about $500, while in 1935 and 1936 it was about $1,550.

Level of Prices

The most important factor affecting profits in poultry farming is the general level of all prices, and it cannot be controlled by the individual poultryman. The relationship is: In general, the higher prices, the higher the poultryman's labor income.

Most of this wide variation in incomes was the result of changes in the general level of all prices.

Feed makes up about one-half of the cost of producing eggs and poultry meat. Therefore, the relationship between the price of eggs and the price of feed is very important. When the price of eggs is high in relation to the price of feed, conditions are favorable for egg production. However, when the price of eggs is low in relation to the price of feed, conditions are unfavorable. The factors that cause egg prices to be high or low in relation to feed prices are the supply of eggs, the demand for eggs, the supply of feed, and the demand for feed. All these factors, of course, are beyond the control of the individual poultryman.

Why Some Poultrymen Make More Money Than Others in Any One Year

There are several reasons why some poultrymen make more money than others in any one year. Moreover, all of them are under the control of the individual poultryman. The five most important ones are: (1) number of layers, (2) eggs produced per layer, (3) layers cared for per man, (4) death loss, and (5) fall eggs.

1. *Number of Layers*

Poultry farm business records have shown time after time, and in state after state that as the number of layers kept per farm increased, the labor income also increased.

The New York survey of commercial poultry farms showed that farms with an average of only 530 layers had a labor income of $798, while those with an average of about 2,100 layers had a labor income of $2,475. In Florida, the poultrymen with large flocks made almost $1,600 more than those with small flocks.

If you plan to specialize in the poultry business and support a family, then you should have at least 1,200 to 1,500 layers per man working on the farm.

If you wish to obtain most of your income from a job in town, and keep some chickens as an additional source of income, then you should be careful not to keep so many layers that they will burden your wife and children with work.

If you plan to operate a full-time farm on which poultry is not

the major, although an important source of income, you should avoid a small flock because they are inefficient. An efficient sized flock for such a farm would be 500 or more layers.

2. *Eggs Produced per Layer*

The number of eggs produced per layer is one of the most important factors affecting the incomes of poultrymen. The general rule is that the higher the number of eggs produced per layer, the lower the cost of producing eggs and the higher the labor income of the poultryman.

A study of poultry farms in Connecticut showed those with the highest rate of egg production made over four times as much as those with the lowest rate of production.

The chicks offered for sale by reliable hatcheries have all been bred to produce a large number of eggs. The never-ending job for you then is to so manage the chicks, and later the layers, that you can obtain the greatest possible number of eggs from each layer. Hens that lay over 300 eggs per year are widely publicized, but very uncommon. The most successful poultrymen get around 200 to 225 eggs per layer during the year, which is about 3 to 4 dozen above average.

3. *Layers Cared for per Man*

Labor is the second most important cost item on a poultry farm, and it is important that it be used efficiently.

With the cost of labor higher than it has ever been before, and prospects good that it will continue high for some time to come, there is an even more important reason why labor should be used efficiently. Work routine and buildings should be planned so that each person working on a specialized poultry farm takes care of 1,200 to 1,500 layers as an average for the year and raises the necessary number of young chicks for flock replacement. Built-up litter, multi-storied houses with litter chutes, running water, and feed chutes in each pen all help make it possible for one man to care for more chickens than ever before.

In addition, many poultrymen find it desirable to brood a batch of chicks in the fall so as to make better use of the available labor and equipment and keep the laying house full throughout the year.

On general farms, the number of layers per man will fall far below that on specialized farms because of the other enterprizes. However, an efficient sized poultry enterprise for a general farm ought to have at least 500 layers.

4. *Death Loss*

Death loss has always been and probably always will be a problem for poultrymen. The ex-

perienced and the inexperienced, the large and the small, the old and the young, all are continuously fighting to ward off diseases and keep the death loss low. Yet, on the average, about 15 per cent of all chicks die before they reach maturity, and about 25 per cent of the layers die during the year. In New York State in 1943, the death loss of layers on farms that kept accurate records ranged from a low of 10 out of each 100 layers to a high of 59 out of each 100.

The 1940-41 study of commercial poultry farms in New York showed that the poultrymen with a low death loss made about $130 more than those with a high death loss.

Sick hens do not lay eggs. Since medication is not very effective, the hens lose weight and die quickly. When the death loss rate gets out of control, and it often does, the poultryman is left with last month's feed bill and a lot of dead hens—a sure way of getting out of the chicken business.

5. *Fall Eggs*

Fall eggs is the fifth factor that is under the control of the individual poultryman. Unlike the previous factors, eggs produced in the fall influence the average price received for income; the other factors affected incomes by influencing costs.

Total egg production in the country varies from month to month in a regular pattern. It is highest in April, and lowest in November. Between April and November, production declines each month. Between November and April, production increases each month.

Egg prices, on the other hand, move just the opposite of production. When production is at its peak, prices are lowest; when production is lowest, prices are highest.

Egg prices during the last half of the year are higher than those during the first half of the year. Therefore, it is important for commercial poultrymen to plan their businesses so as to produce a large quantity of eggs during the summer and fall months. This will increase the average price received for the eggs and the labor income.

A study in Connecticut shows that the poultrymen who produced the highest proportion (over 50 per cent) of their eggs during the last six months of the year made a labor income of $2,158 while those with the lowest proportion (under 40 per cent) made only $678.

In New York State, poultrymen who had over a 40 per cent rate of lay during the October-December period made an income that was about $200 over that for those with less than a 40 per cent rate of lay.

Five Factors for Success

All in all, this article boils down to the bare fact that poultry farming is a business, and to operate this type of business successfully, you must:

1. Have a good-sized laying flock,
2. Use labor efficiently,
3. Obtain a high rate of egg production,
4. Keep the death loss at a low rate, and
5. Produce a high proportion of eggs during the last half of the year.

It is not enough to be above average in only one or two of the important business factors. For best financial results, you should be average or better in all the important business factors. In New York, the farms that were average or better in three of the important factors made about $2,600 more than those that were below average in all factors. In Connecticut, the farms above average in six important factors made about $3,300 more than those below average in all factors.

A poultry farm business is just like an automobile. It runs smoothest and best when it is hitting on all cylinders. If it is not hitting on all cylinders, you get a jerky, uncertain ride, and you may or may not get to the place to which you planned to go.

Pasture . . . What About It?

Condensed from Guernsey Breeders' Journal

C. C. Bender

Dairy Research Specialist, N. J. Agricultural Experiment Station

PASTURE is like the weather—it makes a fine subject of conversation; unlike the weather, however, something can be done about it. The reason more has not been done about it is because most dairy farmers and breeders insist on delegating the poorest part and usually the untillable fraction of their holdings to pasture. The most likely reason for this choice is based on the logic that the land is practically worthless anyway so anything harvested from it is pure profit.

Any dairyman is justified in putting the best land he owns into good productive pasture.

This statement will be a shock to many readers because they are convinced that corn is king and it is heresy to challenge the king. Corn is used as the illustration because it is the highest yielder of the grain crops. To make a corn crop the standard practice is to manure an old sod. Many dairymen use from 10-20 tons of manure and frequently the manure is fortified with superphosphate to make it a balanced fertilizer. The land is plowed, disked and harrowed to prepare the ground for planting. When the corn is drilled or checked in, some commercial fertilizer is drilled in with it just to help the seedlings out of the ground and establish the roots until they can go down after the organic fertilizer that has been plowed under. The corn is then cultivated three or more times and too frequently this is being done when the operators should have been in the hay fields. With a lot of luck perhaps the field yields 100 bushels of shelled corn to the acre.

Now let's examine a combination of seedings established for pasture. Take a mixture of alfalfa, ladino clover and brome grass. The seed bed was prepared in August, comparatively not as much fertilizer was used as with corn because it is heresy in the eyes of many to think of putting as much fertilizer under a pasture seeding as you can put under corn. The yield, however, is twenty tons of green lush pasture for the season. With judgment in grazing, fertilization and management this pasture will repeat that yield for several years instead of for just one year. The

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beauty of this crop is that in combination with the aesthetic factors previously listed, the cattle are getting something to eat, filling up in a hurry and then reclining in the shade and ruminating. Now let's make a further comparison. A 100 bushel yield of corn per acre will furnish 537 pounds of protein and 4,480 pounds of nutrients, but the corn had to be husked, shelled and ground for the cattle. The 20 ton yield of pasture furnished 1,800 pounds of protein and over 6,000 pounds of nutrients which the cattle harvested themselves. True, this type of pasture is not permanent but it is perennial and will furnish a lot more feed than permanent pasture sods. Some readers may think that the yields are extreme but cut both the yields in half and the proportion remains the same and the protein and nutrients are still furnished more cheaply in pasture.

It is true that the seeding combination for pasture mentioned above cannot be used in all sections of the country but all of the dairy sections of the country have legume and grass combinations that are adapted to a particular area. When these combinations are well-fertilized and managed they will produce and will make cheap milk and animal gains.

A good pasture seeding should be a combination of legumes and grasses adapted to particular soil and climatic conditions which will furnish an abundance of grazing throughout the pasture season. This seeding should be a triple purpose one from the standpoint of management. It should not only furnish pasture, but an excess may economically be cut for hay or grass silage. From the grazing management standpoint four to six pasture fields should be established with different seeding mixtures having different maturity dates and which include some drought resistant species. In some sections of the country dependence must be placed on some annual pasture crops such as sudan grass to furnish midsummer pasture insurance. These pastures should be grazed in rotation and then rested to furnish renewal growth during the season. This method of management eliminates over-grazing which is injurious to the tall growing legumes.

Some seeding mixtures which would satisfy these conditions in the humid sections of the country are as follows:

For fertile, well-drained, upland soils: (1) 12 lbs. Alfalfa and 10 lbs. brome grass or (2) 10 lbs. Alfalfa, 4 lbs. medium red clover, 6 lbs. Timothy and 7 lbs. brome.

For soils not as well drained: (1)1 lb. Ladino clover and 12 lbs. brome grass (2) 1 lb. Ladino clover and 6-8 lbs. of orchard grass (3) 1 lb. Ladino clover, 4

lbs. alsike clover, 8 lbs. brome grass and 6 lbs. timothy (4) 1 lb. Ladino, 20 lbs. tall oat grass.

For droughty soils: (1) 12 lbs. alfalfa, 20 lbs. tall oat grass (2) 12 lbs. alfalfa, 10 lbs. brome grass (3) 12 lbs. alfalfa, 8 lbs. orchard grass.

For poorly drained soils: (1) 1 lb. ladino clover, 6 lbs. reed canary grass (2) 1 lb. Ladino clover, 4 lbs. alsike clover, 4 lbs. red top, 4 lbs. Kentucky blue grass.

In the mixture listed, the orchard grass and tall oat grass combinations will furnish the earliest grazing. The orchard grass seeding should be grazed when the grass is immature, i. e., before it shows signs of coming into head. Alfalfa combinations should be grazed in the early bloom stage if the alfalfa is to be kept productive for several years. The brome grass-ladino clover combinations will furnish medium early grazing. Reed canary-ladino combinations on poorly drained soils furnish excellent midsummer grazing. Alfalfa, brome grass, orchard grass and tall oat grass are all more tolerant of hot, dry weather than common blue grass-white clover pasture sods so they remain productive much longer in the summer.

Permanent pasture in the humid sections of the country consist mainly of blue grass, both Kentucky and Canada, native wild white clover, red top, bents, fescues, etc. These for the most part furnish spring grazing and fall grazing. During the hot, dry season they furnish very little, other than exercise. These can be made more productive through the use of lime and fertilizer and their growth can be somewhat extended in the spring and picked up more quickly in the fall through the use of high nitrogen complete fertilizers such as a 5-10-5 or 10-10-10 mixture applied at the rate of 500-1000 pounds per acre in the late fall or early spring. One or two fields of permanent pasture may be included in the rotation pasture system if these fields are unplowable or are on land subject to erosion. These pastures can be improved by seeding them to ladino clover in the following manner. Overgraze the permanent pasture in the fall with dry cows and bred heifers, then apply lime, if needed, and 500 lbs. of a 5-10-10 fertilizer. Follow this with a light application of manure. In the spring when the ground is freezing and thawing broadcast 1 lb. of ladino clover per acre. By using this procedure ladino clover stands of from 30-50 per cent in composition have been produced in two to three years.

There is a great difference in the yield of legumes and grasses depending upon strains and their adaptability to different locations. Under New Jersey conditions

Kansas strains of brome grass are twice as productive as Canadian strains. These differences also show up in alfalfa varieties. A sound procedure is to follow the recommendations of your State Experiment Station.

There is no best way to make a pasture seeding, on a seasonal basis but these are the procedures that have been found to be consistently good.

1. Lime the land to bring the pH of the soil up to 6.5-6.8.

2. Plow down a good application of phosphated manure, 50 pounds of superphosphate per ton of manure, or 1000 lbs. of 5-10-10 fertilizer.

3. Prepare a good firm seed bed.

Use 1½ bushels of oats as a companion crop. Put the alfalfa, clover and grass seeds other than brome or tall oat in the grass seed attachment of the grain drill. Brome grass should be mixed with the fertilizer, being put on from the fertilizer attachment of the drill. If the plans call for 200 lbs. of fertilizer per acre and 10 lbs. of brome is to be seeded per acre, mix 10 lbs. of brome with every 200 lbs. of fertilizer. Brome will not go through the grass seed attachment. Tall oat grass must either be seeded by hand or mixed with lime and seeded through the lime sower. The seed of the grasses and legumes should be dropped on top of the ground and not planted at the same depth as the oats. After seeding, cultipack the field both ways.

The seedings except for the brome and tall oat grass, may also be made with a wheelbarrow seeder. For most uniform stands split seeding should be made by going both ways of the field. Legumes other than ladino clover should always be inoculated.

The oats may be grazed off by the cattle or cut for grass silage or hay to reduce competition with the new seeding.

The seed bed preparations are the same as for spring seedings, and any seeding combination may be used, although no companion crop is used. Brome grass and timothy get off to a better start when seeded at this time.

Again the seed bed preparations are the same and all methods are the same as for spring grains except that in this case the grass alone is seeded with the barley or wheat or rye. The legume seeds are broadcast early in spring, when the ground is freezing and thawing. The winter grains may be grazed lightly in the late fall, grazed down in the spring or cut for silage.

The spring seedings may be grazed lightly in the seeding year, fall seedings may be grazed lightly the following year.

None of these pastures will stand overgrazing or close grazing if the alfalfa and ladino clover

is expected to be a dominant part of the combination for some years. Have it grazed down to about a 2 in. height and then move the animals to another field.

Mow the fields several times a season after they have been grazed to control weed growth and eliminate unpalatable spots.

In a pasture system such as this where an acre of pasture is set aside for each cow, some of the first growth may be cut for hay or silage. This helps in the grazing management by controlling growth of the plants.

Pastures which through age have reverted to grass, or permanent pasture sods may be used for late grazing. Alfalfa combinations should not be grazed for a month before the first killing frost or before it becomes dormant in the fall. After a killing frost it again may be grazed. Ladino clover should go into the winter with a 4-5 in. top growth.

On a stand that is almost solid legume beware of bloat. Don't turn the cattle on it when it is heavy with dew unless they have had a light feeding of hay. A good balance of legumes and grass will practically eliminate bloat worries. Feeding some hay or silage with lush pasture will keep the animals in better condition and will hold production.

For good pasture yields, combinations of legumes and grasses are most productive where the soil is in the range of pH 6.5-6.8. Follow a sound liming program. In order to get good yields and longevity these mixtures should be fertilized with 500 lbs. of an 0-12-12 fertilizer or equivalent annually. This may be applied on heavy soils either in the late fall, early spring or after the first grazing. On light soils spring fertilization is a more standard practice.

If it is desired to use manure on these combinations, fortify the manure with 50 lbs. of superphosphate per ton and apply a light dressing of not more than 5 or 6 tons per acre in the early fall.

For pasture that is predominantly grass, a heavy application of phosphated manure may be applied if the first growth is to be used for hay or silage. If it is to be grazed use a light top dressing.

Grass pasture may also be stimulated with applications of complete fertilizer, such as 5-10-10, 10-10-10, or equivalent, at the rate of 500 lbs. per acre.

On some soil types boron is essential to good productive alfalfa yields. When this is the case 20-25 lbs. per acre may be applied annually with the other fertilizer.

Good pasture is essential to sound livestock management. Because of its potentials one is justified in spending time, and effort to insure a plentiful supply of this highly nutritious feed.

Hidden Values Found in Grass-Fed Beef

Condensed from Kentucky Farmers Home Journal

W. P. Garrigus

University of Kentucky

GRASS cattle to most market men and consumers have been rated as definitely inferior to grain-fed cattle. Results are now available from a number of experiment stations which indicate that this disfavor is in a large part unjustified. The U. S. Department of Agriculture in cooperation with the Virginia Experiment Station after a number of carefuly controlled tests reported that cooked beef from grass-finished steers contained twice as much Vitamin A as cooked beef from dry-lot-fed steers of similar finish. In these days when many of us are buying Vitamin A at the corner drug store, we should certainly be familiar with this fact.

The University of Illinois in Bulletin 475 states that packer discrimination against grass steers is based on the assumption that grass steers yield a smaller percentage of dressed carcass, shrink more in the cooler, produce carcasses of inferior grade to those of grain-fed steers. They also state that:

"In general it is true that grass cattle (cattle given no grain) produce carcasses that grade no higher than Medium, regardless of how well bred the cattle may be, primarily because of lack of finish. There are exceptions, however, to this generalization. In certain limited bluegrass areas in the United States cattle grading Good are produced with no grain, presumably because of the richness of the grass. Argentina, which is reputed to possess the best commercial breeding herds in the world, produces much Good and Choice beef upon alfalfa pasture alone. It has its own peculiar method of pasture management; alfalfa is grazed the year around, and it is customary to regulate the closeness of grazing by moving the cattle from field to field. Perhaps a similar system in this country would produce better beef than is now produced here on pasture."

They conclude that the inferiority of grass cattle can almost always be accounted for by lack of finish and yellow fat. A consumers preference survey conducted throughout Illinois showed that the average consumer

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does not discriminate against yellow fat but, on the contrary the people of the medium and low income groups actually prefer yellow fat "because it looks richer." The Virginia results prove that these people were actually getting a more nutritious meat, even though official grade standards cause beef with yellow fat to be graded down. The Illinois researchers found no connection between pasture and dark lean.

At least seven other experiment stations have compared grass beef with dry-lot beef and found that other things being equal, the pasture steers ranked fully as high in palatability and tenderness. Apparently the only justifiable reason for discriminating against pasture beef is the lack of finish.

How I Fitted My Lambs for Chicago

Harold Barber
University of Kentucky

THERE are some lambs and aged sheep that will never fit out to be good handlers. You have to breed for good backs, good loins and legs and deep twists. All those who saw the grand champion at the Chicago Fat Stock Show in December remarked how his leg of lamb let down to his hock. You have to have attractive lambs that draw attention when you look at them.

The lambs have to be fitted out right and be ready the day of the show. You can't have them ready two weeks too early or two weeks too late. Then you have to put in a lot of time on them and use plenty of elbow grease.

My lambs were fed during the summer on bran, oats and oil meal. In September they were put in the barn and fed oats, corn and oil meal, and good hay, with a little beet pulp—not enough to make them wastey. Exercise is a very important factor. They should be walked every day. Another very important thing to remember is to feed so they will eat tomorrow. You should feed with the clock; they know the time as well as you do, and if you have different breeds they should be separated for fitting. Then, you will have some lambs that come along faster than others, in which case you might have to separate them when you feed grain.

It is well to weigh them every two weeks. It will give an idea how they are coming along, but a good shepherd can tell just by looking at them.

Sheep Breeder

Ranch Animals May Be Starving

Condensed from Farm and Ranch

W. C. Tully

No phase of animal nutrition has been neglected so much, or exploited to such a terrific extent as has that of mineral feeding. While train-loads of minerals and mineral mixtures have been sold for many years over most of the country, the work of mineral nutrition has hardly been started. Its extreme importance is not fully understood by the average cattle and sheep ranchman.

Phosphorus deficiency in both dairy and beef cattle has been described so frequently that repetition seems unnecessary. Yet, probably at least half of our livestock do not receive enough phosphorus. These may not be starved for this mineral enough to show the extreme symptoms of bone chewing that is still common in some sections. Yet, even if these extreme symptoms are lacking, unbiased work has shown that all of these animals grow better, look better, have more healthy offspring, and yield much better financial returns where adequate phosphorus is supplied.

A deficiency of phosphorus leads to two different subjects. One is grain rations for dairy or beef animals and the other is mineral mixtures.

On the first subject especially, far too much feed is still evaluated by the price per bag or ton. Surveys show that 30% of the feed buyers are interested principally in the price per bag. This has resulted in a long time race to see who could put out the cheapest possible feed. And the results, measured by costs of units of gain, have not been encouraging.

A serious disadvantage of adequate phosphorus fortification in feeds that are cheap per ton is that phosphorus carriers are relatively expensive. It matters but little from a price standpoint whether steamed bone meal, spent boneblack, properly defluorinated phosphate or dicalcium phosphate are used; the phosphorus in each, per unit, is still expensive. And no dairy or beef cattle feeds known to this writer ever carried a guarantee on their content of elemental phosphorus. Even if they did, feed control officials of various states have not started to check these guarantees in feeds, though this is commonly done in mineral mixtures. So in

Reprinted by permission from Farm and Ranch, Dallas, Texas, 1946

buying cheap feeds there is very little chance that they contain adequate phosphorus.

Over a period of many years, minerals for cattle, sheep, hogs, horses, and even for poultry, containing 1% or less of elemental phosphorus have been sold at prices that carried far more than a reasonable profit. Good mineral mixtures that contain 6% or more of elemental phosphorus, a high percentage of calcium, and adequate levels of the extremely important trace minerals in addition, can always be purchased at a reasonable price from reputable companies. But to select the right one requires a little knowledge not only of what the mixture should contain, but particularly how much. Then a close study of the feed tag or guarantee on the bag will allow a proper evaluation. But phosphorus is only one of fourteen elements known to be required by farm animals.

The mineral matter of the animal body is made up of a large number of elements, present in different amounts in various parts of the body and depending on the functions they perform. The percentages of the principal mineral constituents of the body are as follows:

Calcium	1.33 %
Phosphorus	0.74 %
Sodium	0.16 %
Potassium	0.19 %
Chlorine	0.11 %
Magnesium	0.041%
Sulphur	0.15 %
Iron	0.013%

In addition to these elements, iodine, manganese, copper, cobalt, sodium (from common salt), and fluorine are essential. The need for the other trace minerals, zinc, silver, and boron, is not yet fully understood.

In the Gulf Coast area of Texas, it is known that roughages and pasture grasses are seriously deficient in calcium, deficient in phosphorus, and very probably deficient in some of the important trace elements. It is quite likely that other deficient areas are quite common in the Southwest. Preliminary analyses show that the calcium content of some pasture grasses from parts of this area contain only one-third as much calcium as some pasture grasses from other sections of the nation. This by no means indicates that all pasture grasses from the Southwest are similarly deficient, because areas, and even farms in the same area, vary markedly in minerals. In addition, the different plants vary greatly in the way they draw minerals from the soil, and consequently in their mineral analyses. Similar work has shown also that phosphorus may be seriously deficient in many areas. The extremely important work done on this subject by the Federal Government, Texas A. & M. College,

and the King Ranch cooperatively should be much better known. Like the grasses, to which little attention has been paid, the grains used to supplement the pasture or roughage may also be seriously deficient.

What is far more important, the human family probably is affected. We, of course, eat processed grains, and meat or other products which animals yield. Some or all of these may be deficient in correct kinds or amounts of minerals which are essential to your diet or mine. Not only will far better farm animals and their products be produced by better feeds, but animal growth, health, production, reproduction, and consequent profits by far greater. The small cost involved in supplying needed amounts of minerals is but a trifling percentage of the added profits that will be yours.

Three-Time Milking

If labor is available, and the dairyman is in a milk shortage area, one means of getting more milk is to switch to three-times daily milking. Dairymen who milk twice daily can switch to three times in 24 hours, and increase the daily yield from 10 to 20 per cent.

While there is still a labor shortage in some areas and while culling of mediocre cows may have taken place, this plan still provides a way to get more milk. Many dairymen consider they must sell a certain amount of milk each month to carry on.

A little more grain and roughage will be needed because milking three times a day means cows should be fed three times a day. Three-timing also helps udder health by preventing overloading the delicate udder tissues of the heavy milking cows.

There should be eight hours between milkings. Some dairymen recommend 11 p.m., 7 a.m. and 3 p.m. as the best hours. This schedule permits attending an evening meeting or a movie, and does not require too early rising. Other owners do not hold to the eight-hour periods, and some milk at 5 a.m., 1 p.m. and 7 p.m., believing that these hours fit in better with field work demands.—*E. J. Perry.*

N. J. Farm and Garden

New Life for Wornout Land

Condensed from Capper's Farmer

George A. Montgomery

Soil so exhausted that crop farming no longer pays can be brought back to make pasture gains that compare well with those of rich land in the heart of the Corn Belt. At Dixon Springs Experiment Station, a 5,000-acre tract taken over by the University of Illinois to determine whether a profitable type of agriculture could be developed for eroded areas of southern Illinois, it took lime, phosphate, grass—and good management methods—to rehabilitate depleted farms.

A 20-acre redtop-lespedeza pasture at Dixon Springs, in washed-away Pope county, produced 307.8 pounds of beef an acre. One Pope county farm, now a part of the station area, produced only 20 bushels of corn on its whole planted acreage the year before it was bought for present use. The crop had to be sacked and carried out on horseback because the area was so washed that a truck or other wheeled vehicle couldn't reach the farm!

That tract was typical of many in the area. Great gullies gashed the hillsides. Brown subsoil had washed down to cover the black loam of once-fertile valleys so deep a 42-inch auger would not reach it. The scarred fields were covered with briars, sassafras and persimmon sprouts, grass that takes to sterile soil, and weeds. Men who had cleared the timber knew only corn farming. The rolling, erodible land, thin at best, was not adapted to that type of agriculture. There could be but one result — poverty-stricken farmers on a bankrupt soil.

H. P. Rusk, now director of the Illinois station, W. L. Burlison, W. G. Kammlade and others of the staff, knew the first step in alleviating bankruptcy consisted of pouring in new assets and that the second was adoption of management methods that would best prevent dissipation of those assets. They poured in lime and phosphate, and established a grass meat-making program to conserve the land's physical assets.

The 307.8 pounds of beef an acre was produced on a 20-acre pasture grazed 180 days by 18 steers that put on 1.9 pounds a head daily. The next 20 acres carried 15 yearlings the same length of time for daily gains of 1.4 pounds a head. The third year it

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carried 14 steers 130 days and they put on 1.3 pounds a head daily. Average beef production was 211.7 pounds an acre annually for the 3 years.

Undoubtedly a large part of that gain could be credited to the lime and phosphate applied, one of the Dixon Springs sheep trials would indicate. During the second and third year of the beef test, limed and unlimed land was used for mutton production. The 2-year average for limed land was 162 pounds of sheep gain an acre, compared with 163.6 pounds of steer gain. Each acre of unlimed land yielded but 43.5 pounds of mutton annually an acre. The limed land had received 250 pounds of 36 per cent superphosphate an acre 5 years before the sheep tests started. There may have been some carry-over benefit from the phosphate, but if there was not, then 4 tons of lime were responsible for production of 118.5 pounds of mutton.

On that basis, 2,937 pounds of lime had a value equal to that of 1 acre of untreated land. Cost of lime and its application was $2.50 a ton. That would give the land, without treatment, a value of $3.55 an acre in terms of the cost of lime. It may have had a higher value in terms of its ability to produce. In any case, a 4-ton liming made the land 3.72 times as productive as before treatment.

Another comparison should not be overlooked. Hay production on unlimed land averaged 1.66 tons an acre; the limed land's yield was 2.17 tons. Difference in weight of forage was not great. That would indicate that roughage on treated land had higher feeding value. Part of the superiority was due to the fact it had fewer weeds and a higher percentage of legumes in it, but much undoubtedly was due to the fact that lime had put into it more of the elements needed for animal growth.

Mutton and hay yields mentioned were made on a series of six 10-acre plots set up in an all-grass management plan. These plots are handled in pairs. A group of ewes and their lambs graze 1 plot during the summer, and hay is made on the other to carry the ewes thru the winter. Next year the hayed plot is used for pasture, and the other is grazed. Alternating plots between hay and pasture helps control parasites and weeds.

An untreated 10-acre plot carries but 10 ewes and their lambs in summer, and hay from the sister plot will supply feed to winter but 10 ewes. Annual production for the 20 acres is 800 pounds or more of lamb, plus the wool clip from the ewes. Two fertilized 10-acre plots supply pasture for 30 ewes and their lambs and winter hay for the 30 ewes. Sheep that depend on this land

are as well fed and as growthy as those on untreated land that supports but 10 ewes and their lambs. Treatment on these plots included 4 tons of lime an acre in 1936, 200 pounds of 36 per cent superphosphate an acre in 1937 and 100 pounds in 1940, followed by 100 pounds of 63 per cent superphosphate in 1941. The third pair, limed in 1936 and phosphated in 1937, produced the 2-year average of 162 pounds of mutton an acre, which was mentioned above.

On land not too steep to be worked occasionally, carrying capacity is stepped up by use of cultivated crops. A treated 65-acre tract now carries 150 ewes and their lambs. Visitors last fall found 15 acres of it in permanent pasture, 10 in rye, 10 in winter wheat, 15 in legumes for pasture or hay and 15 in a soybean-Sudan mixture to go into the silo. Balbo rye and vetch had preceded the silage mixture. The rye was ready to graze March 14. It was pastured down, then the livestock went to winter wheat. The 2 fields of early grain pasture carried the flock until May 1, and there was a good growth of vetch on the rye field to be plowed down. That gave the soybeans and Sudan a good start, and R. J. Webb, station superintendent, estimated silage yield would be close to 10 tons an acre. When silage was off, the field, which is not so rolling as much of the land at the station, was to be seeded to Balbo rye and crimson clover to be pastured out in the spring of 1946 in time to put in another seeding for the silo.

Small grain pasture works well with early lamb production. It puts ewes in good flesh and insures heavy milk production to keep lambs gaining at maximum rate. The flock takes a turn on the permanent pasture after rye and wheat are finished, then goes to the legume field until lespedeza is ready in the permanent pasture.

Such a management plan has definite advantages over a small grain-lespedeza pasture program, whether for lamb production or beef making. It provides a steady succession of lush grazing, whereas there may be a lean gap between the time small grain is pastured out and lespedeza is ready for heavy grazing.

Examples cited are not intended to give a complete picture of Dixon Springs station, with its 100 purebred Herefords, nearly 400 grade cattle and 1,000 or more sheep. Rather, they were picked to give a hint of what is possible in rehabilitating farmed-out land subjected to heavy rainfall.

Brahman Cattle in the South

Condensed from Southern Agriculturist

W. T. Cobb

Extension Animal Husbandryman, Louisiana

ALTHOUGH Brahman cattle have been in the United States for nearly a hundred years, it has been only in the past 30 or 40 years that this breed has attracted much attention from livestock breeders.

In 1854 an English subject visited the Richard Barrows of West Feliciana Parish, Louisiana, for the purpose of studying cotton and cane production. Noting the use made of oxen for farm work in this section, and having already observed the Indian cattle at these tasks in their native land, he later sent the Barrows a few Brahman bulls with the idea that they would improve the native cattle for the production of work oxen. There seems to be little reason to believe that either the Englishman or Mr. Barrow believed that these cattle would contribute much to the meat production of the native cattle. These first Brahmans unquestionably left their mark on the cattle of the Felicianas and probably contributed much to the vigor of the native cattle.

Soon after the close of the War between the States a Mr. Shannon bought some of the Brahman grade cattle from Mr. Barrow and moved them to his ranch near Galveston, Texas. These animals were later purchased by J. A. McFadden of Victoria, Texas.

In 1875 a Mr. Kennedy bought 20 head of grade cattle from near New Orleans, evidently from an importation of Indian cattle by some Louisiana cattleman. These early transactions were followed by the purchase and importation of two bulls direct from India by Mr. J. M. Frost of Houston and Albert Montgomery of New Orleans. All of these Frost-Montgomery cattle were later sold to A. M. McFadden and Tobe Woods of Victoria, Texas.

From these foundation cattle the Brahman blood was scattered from north of Baton Rouge to New Orleans and west to Victoria, Texas. Selection of the most desirable bulls was made from range cattle, thus spreading the influence of this blood along the entire coast of South Texas and Louisiana. Not until the importation of the Borden cattle in 1906

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was there an infusion of new blood from India. This importation was made up of 46 bulls and five cows. Eighteen of these were destroyed in quarantine. Tom O'Connor of Victoria received 16 of those that were left and the Pierce Estate, managed by Mr. Borden, kept the remaining 17.

It should be remembered that the Brahman cattle, in the broadest sense of the word, cover many types and kinds of cattle. The word "Brahman" is almost as broad as the word "horse." In horses, the type ranges all the way from Shetland pony to the giant draft horse, including the trotter, the thoroughbred, the combination and many intermediary types and kinds. The Brahman cattle in their native land vary with each province in which they are produced and range in type and size all the way from the small animals weighing less than 1,000 pounds for mature bulls to the massive animals weighing more than a ton.

In India these animals have been produced over a longer period of time than any other kind of cattle. They have been developed through natural selection rather than through intelligent selection by their owners. Some of these animals were developed for work and some for milk production in a limited way, but in no case was there any definite effort made to develop their beef producing capacity. The cow is considered sacred by the Moslems and therefore is never slaughtered. Bearing these facts in mind it is easy to understand that the improvement in the beef producing capacity of the Brahman cattle has been greater in the past 30 years in the United States than during all their previous history in India.

The Brahmans in this country have been given breed names according to the locality from which they come. The chief breeds in the United States at the present time are the Guzerat, the Nelore, the Krishna Valley, and the Gir—all differing in some important ways. The majority of the breeds of purebred Brahman cattle in this country have accepted the Guzerat as the most desirable breed from the standpoint of ease of handling and beef production.

Due to the fact that few females were ever imported directly into this country, the greater part of the Brahman cattle are the product of the grading up process, mating the Brahman bulls with native cattle until, for all practical purposes, the herds of registered Brahman cattle in the United States today are purebred.

It is generally conceded that the Brahman's chief contribution to meat production is its ability to cross with native cattle, either of beef or dairy breeds or straight scrubs, and to produce calves

with a greater vigor, more rapid growth, and better beef quality, than crosses from the English breeds. Unquestionably some of this increase in growth is due to hybrid vigor. We can assume that this vigor is greater when Brahmans are crossed with English breeds than when two types of the English breeds are crossed, for the simple reason that in one case we have two widely separated species, while in the other we have cattle springing from common stock. Be that as it may (and geneticists differ on this point), the grade Brahman calves usually outweigh the crossbred calves of English breeds on native cattle by from 40 to 80 pounds at six months of age. Under ordinary management there does not seem to be so much difference at one year of age, but at maturity the Brahman grades outweigh the English bred cattle.

The Brahmans are almost entirely immune to fly and mosquito annoyance, which makes them ideally suited to the hot humid region of the Gulf Coast. Humidity affects them very little, with the result that they spend more time in grazing and less time in the shade fighting flies and mosquitoes than other breeds of cattle. Their ability to absorb the punishment of summers on the Gulf Coast seems to be in direct proportion to the amount of Brahman blood carried. Many of the troubles affecting other kinds of cattle seem to affect the Brahmans very little. They are never affected by cancer of the eye, and rarely have so-called pink eye. They are highly resistant to anaplasmosis, but show no greater resistance to Bang's disease or tuberculosis than do the common types of cattle. It is generally conceded that, while they stand heat and humidity without noticeable effect, they do not take kindly to cold, wet winters.

Although Brahmans are usually thought of as vicious and hard to handle, as a rule they are not vicious, but are extremely nervous, active and temperamental. When handled by those who know them and who use judgment based on this knowledge, little trouble is encountered.

It is generally conceded by the best informed authorities in the field of beef production that Brahman cattle can best be utilized by cross breeding with native or beef breeds, thus getting one-half Brahman cows, and then breeding back to English beef breeds. The product of this cross will result in one-fourth-bred calves, which will carry good beef conformation, usually have good colors, and will be nurtured by the half-bred cow who is a good mother, usually a good milker, and able to stand the hard summer conditions and continue to

produce an adequate milk supply to grow out the calf.

In years to come the higher grade Brahman cattle may be developed to the point where high grades can be used for efficient beef production, but at present this breed is making its best contribution through the production of hybrid calves.

Most authorities think that scrub cattle should have a first cross of English beef blood, then the females from the above cross should be crossed to Brahman bulls, and English beef blood injected again in order to get calves that will be one-fourth Brahman, one-half English beef blood and one-fourth scrub. This scheme of breeding is described in U. S. Department of Agriculture Circular No. 673, by A. O. Rhoad and W. H. Black, and is based on results obtained at the Iberia Experiment Station, Jeanerette, Louisiana.

There seems to be little choice of breeds for crossing with Brahmans, as very desirable hybrids have been secured from Angus, Hereford and Shorthorns. The Shorthorn base seems to nick a little better in results so far observed. In fact, the Santa Gertrudis breed established by the King Ranch at Kingsville, Texas, is based on the Shorthorn. The Santa Gertrude carries three-eighths Brahman blood and five-eighths Shorthorn.

In all areas where purebred English-bred bulls can be maintained they are used, and cross bred. Hybrid bulls are used only where conditions are so severe that purebred bulls can not be maintained.

Up to the present time nearly all Brahman commercial breeders are selling calves directly from their dams. A few steers are carried over and find their way to Oklahoma and Kansas grass, and then to market. Few of these have reached the feed lots, although experimental work indicates that they feed well. Their gains in the feed lot are satisfactory, although they do not put on the high finish expected of the English breeds. They do make satisfactory carcasses when slaughtered under two years of age, and they dress out a higher percentage of meat than other beef breeds.

Prejudice against the Brahmans has prevented the utilization of them in the feed lot, but using animals carrying one-fourth Brahman blood, feed lot operators can produce beef grading top good to low choice (according to present U. S. grades) as efficiently as can be done with English-bred cattle.

DDT is the 1946 Potato Insect Killer

Condensed from Eastern States Cooperator

Chas. L. Hovey

SEVENTY-ONE years ago a young German-Swiss chemistry student named Zeidler synthesized a complex organic chemical named dichloro-diphenyl-trichloroethane. As a result of his investigation he was granted a doctorate degree and, as sometimes happens, his work was pigeonholed.

During the war supplies of certain insecticides became very short. Search for substances that might be used as alternates or substitutes was pushed by many governments. About four years ago, Paul Müller, working in Switzerland, first reported on the value of dichloro-diphenyl-trichloroethane as an insecticide and since that time its use has rapidly increased. We can give the British credit for first dropping the lengthy chemical name and adopting the now-famous "DDT."

More publicity has been accorded DDT in the past two years than has ever been given to any other insecticide in a comparable length of time. Its almost miraculous performance in controlling such disease-carrying insects as the human body louse, mosquitoes and flies has attracted world-wide attention and has excited the imagination of scientists and laymen alike.

In discussing the use of DDT as a potato insecticide, let us consider the following questions, bearing in mind that our opinions are open to change because of the fact that new experimental data are becoming available every day.

What Potato Insects Will DDT Control?

Colorado Potato Beetle: You can expect DDT to give excellent control of the Colorado potato beetle in its larval stage, particularly. We anticipate that DDT, if carefully applied, will replace the customary arsenical spray for the potato beetle. DDT sprays or dusts may be slower to kill than the arsenicals in the case of the potato bug, but the end result will be the same, and, in the meantime, the DDT application will have supplied some measure of control for other potato pests, such as the potato aphids, which was lacking in the case of the arsenical treatment.

Potato Aphids: Considerable evidence is available to indicate that DDT preparations will markedly reduce the plant lice

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population. All species of aphids commonly found in the potato fields are killed by this insecticide. Various investigators have found that about 85 percent of the pests are killed. From the table stock grower's viewpoint this huge reduction in aphid population results in large increases in yield. The grower of certified seed may not reap large benefits from the use of DDT alone, the small number of plant lice surviving is sufficient to disseminate virus diseases during the extended life of the potato plant.

Potato Flea Beetle: Field tests with DDT against the potato flea beetle have proved particularly satisfactory. It may be profitable to plan your insecticide schedule to combat the early brood of beetles which so often cause considerable damage to young plants. DDT when properly applied will give excellent control of these potato pests.

Potato Leaf Hopper: Certain investigators have found that DDT may not be as effective against the potato leaf hopper as it is in combating other potato pests. Although the leaf hopper population is markedly reduced, because of the insects' migratory habits, the fields are again soon infested. Nevertheless, the initial reduction in number is so important that we heartily recommend the use of DDT against the potato leaf hopper.

There are a group of miscellaneous potato pests of which the plant bugs are perhaps the most important. One often finds that certain sections of the potato fields, especially those rows bordering the grasslands or fence rows, are heavily infested with these pests. DDT has been found to substantially reduce the damage caused by these insects.

How often DDT should be applied to the potato crop must be left, in large part, to the discretion of the individual farmer. In a dry season when the insect population builds up to epidemic proportions, it may be wise to apply DDT in every regular dust or spray for the control of fungous diseases. In certain areas in a dry season it is even feasible that DDT should perhaps be applied even more often. As with any insecticide or fungicide, the timeliness of application is very often the difference between obtaining satisfactory or disappointing results.

By way of summary, all of the major pests of the potato crop can be controlled to a very large extent by the careful use of DDT.

Will the Use of DDT Result in Increased Yields?

The USDA working in Maine this year obtained an increase of 73 percent in their DDT-treated fields over the yields obtained in suitable check plots. Increases of yield of 50 to 75 bushels are com-

mon and are comparable to what one may logically expect in those years when the insect populations reach epidemic proportions.

What Effect Will DDT Have on the Potato Plant?

DDT has been used by many individuals on many agricultural crops. In the concentrations which have been recommended for insect control, there are few instances of DDT injury to crops. Investigators in Iowa have reported that one variety of squash was apparently injured by applying two pounds of actual DDT per acre in the form of a dust. It is also distinctly possible that other plants of the same family, such as muskmelon and cucumber, may be susceptible to DDT injury.

The potato plant is, to all appearances, not harmed by any DDT-containing spray or dust applied at the recommended rates. DDT can be combined with both organic and inorganic fungicides and insecticides without loss of its toxic properties with the exception of two combinations which have come to our attention to date. Workers in New York State report that DDT when combined as a dust with lime as a carrier resulted in a marked decrease in the toxicity of DDT. This condition may sound inconsistent when we consider that Bordeaux mixture containing lime is compatible with DDT. In this case it may be well to reduce the amount of lime in preparing the Bordeaux spray.

It has also been learned that the presence of small amounts of iron compounds in the dust mixtures may also cause the chemical breakdown of DDT. For this reason, careful consideration must be given to the types of carriers chosen to produce DDT dust mixtures.

A question being asked by many individuals concerns the possibility of sufficient DDT being translocated from the plant foliage to the tubers to cause harmful effects to the consumer. Careful tests are now being conducted by the USDA, the Maine Experiment Station and others, in an effort to prove or disprove the rumor.

As far as is known, DDT does not possess any appreciable lasting or residual qualities when applied to potato foliage. For example, aphids have been seen to fly to recently treated plants and to settle down and feed without any apparent injury.

Cheaper Pullets

Condensed from Poultry Tribune

Melvin V. Flock

Extension Poultryman, Purdue University

A WELL planned pasture not only will reduce the feed cost, but will also help to supply some of those vitamin and protein ingredients which will be scarce during the coming year. A chicken on good pasture gets all the required vitamins for good growth, development, and egg production.

Mr. Harry Simonton, Clark County, Indiana, farmer, has cooperated with the Purdue poultry department in establishing Ladino clover test plots. He compared his feed records during the past few years and found that, with a good Ladino pasture, he was able to have 20 percent of the feed required to grow a pullet to maturity.

The first requirement of a good poultry pasture is a well drained and fertile soil which will stand wear and heavy pasturing. The plot should be free of bare spots and water holes where disease germs can thrive and multiply.

A good poultry pasture should provide succulent growth from early spring to late fall.

Temporary seedings should be used only as emergency pastures. Annual crops are more expensive than permanent seedings since they require more labor for the short time they are used for pasture. Cereal grasses, such as wheat, rye, etc., are much lower in feeding value after they joint.

Permanent pastures require constant care if they are to be maintained. It is important to clip the pasture with a mower at least three times during the growing season to keep weeds from going to seed. Crops which make rapid growth, such as Ladino clover and alfalfa, should be clipped more often to maintain a succulent growth.

In order to maintain fertility, many poultrymen have applied as much as four hundred pounds of 0-20-20 fertilizer per acre in the early spring. It is more desirable to have soil tests made and then follow the lime and fertilizer recommendations of your county agricultural agent.

Keep the range feeders and waterers on the move. They should

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be moved every few days to prevent killing the pasture in spots. In order to prevent bare spots from developing near the laying house, at least two lots should be used. The hens should be rotated often enough to give the pasture next to the house a chance to re-establish.

During the past few years Ladino clover has become increasingly important as one of the most promising pastures for both laying hens and growing pullets.

Ladino clover, a native of northern Italy, is a very large variety of the ordinary white clover common in lawns and pastures. It is a perennial of medium long life, having short tap roots and surface stems that lie flat on the ground and produce fibrous roots at each joint coming in contact with the soil.

The carrying capacity of Ladino clover for poultry is superior to any other known crop. One acre can support 500 to 1,000 growing chickens, depending upon the fertility of the soil and weather conditions. On the farm of Clair Swogger, Noble County, Indiana, one and three-fourths acres of Ladino clover produced enough green feed to care adequately for 1,800 pullets during the dry summer of 1944.

Observations have shown that poultry, as well as other types of livestock, prefer Ladino to any other pasture crop. On the farm of Lee Foster, Fountain County, Indiana, growing pullets had free choice of several kinds of pasture, but they soon learned the location of the Ladino plots. Foster cooperated with the Purdue poultry department in establishing four test plots, consisting of red clover alone, red clover and alfalfa mixture, alfalfa and Ladino mixture, and Ladino alone.

During the entire growing season, the 2,300 pullets spent most of their time in the Ladino and alfalfa-Ladino plots. Even during the early spring, when the red clover and alfalfa were still young, succulent plants, the pullets would wade through perfect stands of these crops and feed on the Ladino plots. It was interesting to watch the pullets work in the plot with both alfalfa and Ladino. They would tramp down the alfalfa and pick out the Ladino plants.

Ladino is a fertile soil crop and does not thrive on sandy or droughty soils. It will, however, tolerate wet soil conditions for short periods and can tolerate slightly acid soils.

Poultrymen who have cooperated with the Purdue poultry department in establishing test plots unanimously agree that Ladino alone is much superior as a poultry pasture when compared to mixtures of Ladino with blue grass, rye grass, red clover, or alfalfa.

Ladino probably will make a better pasture for poultry if it is seeded alone in the early spring as soon as a good seed bed can be prepared. However, it can be seeded in with any fall or spring seeded grains. It also may be seeded alone in August, on a well prepared seed bed.

The price of $2.50 to $3 per pound of seed often scares out a prospective buyer. Actually, it costs no more to seed an acre of Ladino than an acre of alfalfa, because only one and one-half to two pounds of seed are required per acre.

Since only a small quantity of seed is required per acre, it is difficult to adjust a seeder to spread this amount over an acre. One of the best methods to insure even distribution is to mix the seed with finely ground corn meal (not powdered). It is better to use enough meal to go over the plot two or three times in different directions. This will give a more uniform stand.

It is very important not to pasture Ladino clover the first year. The plants should have an opportunity to send out runners and establish a thicker stand.

All of the "good management" points discussed earlier are very important in order to insure maximum carrying capacity and a permanent pasture. It is especially important to provide two lots when using Ladino pasture for the laying flock. If a plot is used continuously, the hens will pick the plants down into the ground and kill the clover near the house. Just remember that the short leaves and stems which are striving to exist near the house are the most succulent and naturally are more attractive to the old hens.

When it is not used for poultry, Ladino can be grazed by livestock. Short grazing periods are recommended with a rest period of three or fours weeks recovery. If livestock cannot be used to keep down heavy growth, it should be clipped four to six times during the growing season.

There's But One Way to Do the Job

Condensed from Soil Conservation

Hugh Bennett

Chief, Soil Conservation Service

THROUGHOUT the world there is pressing need for better adjustment of agriculture to the physical environment—better use of land and water—not only to gain a sorely-needed increase in per-acre production but also to maintain a healthy agricultural economy—which could be disastrously undermined through continuing impairment of our limited supply of productive land.

This adjustment is vital, moreover, if we are to maintain in efficient production the most widely distributed and greatest possible area of productive land as a safeguard against physical difficulties and excessive costs in the distribution of agricultural commodities. This is especially true of those regions of dense population and inadequate transportation facilities — where so often not enough productive land is available to produce needed food. And most imperative of all reasons: These necessary adjustments must be made if we are to maintain our ability to produce in any adequate way at all.

Such essential changes call for the elimination of land-use practices haphazardly — and wastefully—applied to the land, and the widespread adoption, in their place, of various conservation practices scientifically fitted to the needs and physical characteristics of the land, the climate, and the type of farming.

These practices, applied in this way, will at once protect the land and increase its productivity by conserving the soil itself, its available elements of fertility and all that man and nature put into the soil together with a valuable portion of the rainfall that would otherwise be lost as runoff. This is of primary importance because there is no other way by which the agricultural plant of the United States—or of the world—can be kept in a safe and permanently healthful condition necessary to support a permanent agriculture. And further, it is vitally necessary because it is the only way to get from the land anything like the sustained yields necessary to feed the world.

Soil conservation as practiced by trained soil conservationists is a technique in land use and protection that was never previously

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employed in any general way anywhere. It is not only the cheapest and most effective way of protecting farm land from destructive erosion, it is the only practical way to keep cultivated and grazing land permanently productive. Other methods, such as the single-practice method of terracing, have failed to the extent of permitting millions of acres to be ruined for any further cultivation.

Until this new system came on the scene, in 1933 in the form of the program of the Soil Conservation Service, our farm lands in the United States were being impoverished at a rapidly increasing pace. The extent of damage by erosion during the 40-year period from about 1890 to 1930 probably exceeded all previous damage to the farmlands of the country. But now, finally, with the aid of this new technique we are definitely turning the tide; we are winning the fight against the greatest enemy to protective land—uncontrolled soil erosion.

When we started the program, I scarcely expected to live long enough to witness the profound agricultural revolution that is now spreading throughout our country. I look upon it as the greatest agricultural achievement of all time, for without productive land there can be no adequately productive agriculture. Even now a third of the people of the world are hungry most of the time, and still greater numbers have inadequate diets.

Twelve years ago (September 19, 1933) the first comprehensive scientific action effort in the world to achieve conservation of soil and water resources on a nation-wide scale was undertaken by the United States when the program of the Soil Conservation Service —then the Soil Erosion Service— got under way. From the beginning, one cardinal principle dominated and guided this program. Some called the principle idealistic and impracticable; others failed to grasp its significance; but farmers, after a brief period of convincing demonstration, very generally accepted it enthusiastically.

That basic, guiding principle was at the outset and is today as follows: *Effective prevention and control of soil erosion and adequate conservation of rainfall in a field, on a farm or ranch, over a watershed, or on any other unit or parcel of land, requires the use and treatment of all the various kinds of land comprising such areas in accordance with the individual needs and adaptabilities (or capabilities) of each different piece of land having any important extent.*

Like any precise statement of a rule, however, this principle requires some qualification.

First, the use and treatment of

a given area of land must be determined not only by its physical characteristics, but also, whenever possible, by such considerations as available facilities —implements, power, labor, financial means—as well as by the preference of the farmer, his ability to learn, his willingness to try new methods. In other words, the treatment must fit not only the needs and capacities of the land but the needs, adaptability, and preference of the farmer himself.

The second qualification of the general principle is that each distinct parcel of land to be treated must be considered in any pertinent physical relation it may have to any adjacent or neighboring tract, or to the entire farm, ranch, or watershed. Whereever possible, the use and treatment of one area should provide as much protection as may be practicable for adjoining or nearby areas. For example, the management of lands on higher elevations should take into consideration their relation to downslope lands. Outlets for surface run-off always should be located with proper regard to the effect of discharging water and water-transported soil material—sand, gravel, rocks, infertile material from contributory gullies—on adjoining lands, highways, or other areas susceptible to damage. Such water can do much damage along its course, as by cutting out gullies; or, it can be beneficially disposed of by safe discharge over pastures needing extra water.

To carry out such a completely coordinated soil and water conservation program on a nation-wide basis requires a great deal of basic information for the most efficient blueprinting (planning) of each farm for effective application of protective practices to the land. There are hundreds of different soils ocupying varied slopes and subject to different intensities of rainfall and varying temperature. These numerous varieties of land, occurring under a wide range of climatic conditions, are adapted to a wide variety of plants, requiring different cultural practices. From place to place—even on the same farm—these varied land conditions and different uses and treatments result in varying susceptibilities to erosion and losses of rainfall. And both active erosion and erosion hazards call for special conservation provisions.

It is probably safe to say that no two parcels of land are identical. Accordingly, each field—even each lot—requires its own particular conservation treatment. Our conservation specialists have found that in some localities each farm, each ranch, is a special problem within itself—calling for a special job due primarily to the physical environment. Hence, a

special plan is made—must be made—for every farm of the nation.

TOOLS OF SOIL CONSERVATION

Since soil conservation is the proper use and care of land, so that it will produce the greatest amounts of the products most needed, while, at the same time, protecting the land from loss of productivity, all measures that help keep land in condition favorable to sustained production are, therefore, tools of conservation. Terraces, contouring, organic matter, grass, legumes, shrubs, trees, crop rotations, fertilizer, drainage where the land is too wet, *and irrigation* where it is too dry—*all of these and whatever else is needed are conservation tools that are utterly indispensible to getting the job of soil conservation properly done.* These tools are used singly where the land is easy to stabilize, and they are used in combination, one supplementing another, where the conservation needs are more complex.

In other words, soil conservation includes any and all measures that will in any way increase the productivity of the land or make the land keep on producing satisfactorily.

Some of the Land Troubles and Deficiencies That Soil Conservation Helps Prevent are:

1. Topsoil washing or blowing away;
2. Land torn to pieces by gullies.
3. Covering good land with infertile erosion debris;
4. Exhaustion of plant food in the soil by overcropping and leaching;
5. Accumulation of toxic salts;
6. Water-logging of the land;
7. Improper irrigation;
8. Burning of organic soils;
9. Excessive burning of grazing areas;
10. Improper cultivation;
11. Single-crop farming.

Some of the Things That Soil Conservation Does are:

1. Holds soil and its contents of plant nutrients in fields, pastures, and woodlands;
2. Maintains or increases the supply of beneficial organic matter and organisms in the soil;
3. Keeps land productive;
4. Stores rainfall in the soil for crop use;
5. Increases diversification of crops;
6. Increases per-acre yields;
7. Makes cultivation easier and more efficient;
8. Reduces cost of operation and maintenance of farm machinery;
9. Increases farm income;
10. Reduces waste of rainfall and helps control floods;
11. Reduces the filling of stream channels, ditches, and reservoirs with the debris of erosion;

12. Reduces stream pollution;
13. Improves conditions for wildlife and fish;
14. Puts all land into productive use according to adaptability;
15. Develops habits of people working together on common problems;
16. Brings people to love the land and develops appreciation of rural life.

How the Job is Done. There are many things that can be done; some of them are as follows:

1. Use suitable erosion control practices and structures to stop soil washing and blowing;
2. Hold the rain that falls on the land for use of crops, trees, grass, livestock, or other purposes;
3. Use manure, fertilizer, and lime where needed, in the right amounts and at the right time;
4. Use suitable tillage, mulching, and cropping practices to protect the land and save rainfall;
5. Drain over-wet or waterlogged fields;
6. Plant grass, shrubs, trees, or legumes on land too steep, shallow, or erodible to plow, also on land too poor for growing field crops;
7. Flood fields where toxic salts ("alkali") have accumulated in excessive amount, to leach out the salts;
8. Protect organic soils (peat land) from fire by flooding or by raising the water table;
9. Open up suitable new lands, where needed, under conservation methods, to increase cropland;
10. Increase supplementary feed crops on grazing enterprises to help prevent overgrazing;
11. Support conservation work with continuing program of research aimed at quickest possible solution of problems arising in connection with field work.

These and other sound farming and ranching practices that protect the land and increase production efficiency are, as previously pointed out, the tools of soil conservation.

Where the slope of fields is steeper than 8, 10, or 12 percent, or where depth to rock is less than a foot and to impervious clay less than 3 inches, the conservationist knows that the land is hardly ever safe for regular plowing. Grass, legumes, trees are better crops for land of this kind because they hold the soil in place. In regions of heavy rainfall, terraces to control runoff are built more sturdily than in areas of gentle rains. If yields drop off, if the forage of pastures becomes scant, the conservationist uses

manure, lime, soil-building legumes, and appropriate mineral or other fertilizers to improve the productivity. He plants raw gullies to grass, trees, or vines; or, if these will not grow well, he may use small dams or other mechanical measures to stop soil washing. Critical spots in fields he safeguards with kudzu or other effective soil-building crops that better fit the situation. Wet spots call for tile drain or open ditches, according to local conditions. Dry lands call for irrigation or water spreading. Acid lands need lime, while some alkaline lands will be benefited by additions of sulphur to correct alkalinity.

Who Does the Work? In order, then, to apply a complete program of conservation-farming methods to a farm—in its entirety—it is necessary to combine the techniques of all the pertinent branches of agricultural science, together with necessary engineering, hydrologic, biologic, geologic, botanical, chemical, and other skills.

A single farm may require contributions from soil and water conservationists, agronomists, hillculturists, geologists, foresters, engineers, hydrologists, wildlife specialists, chemists, and others.

The soil conservation program has developed a new science as well as a new specialty — *the science of soil conservation* and the specialty of the *soil conservationist*. The former is what the name implies and the latter is a practical technician capable of recognizing the ordinary needs of land for conservation of soil and water, and who also has the ability to apply skillfully, scientifically, the various conservation techniques, singly or in combination, as needed.

There still will be needed, moreover, for efficient forward movement of the present national action program of soil and water conservation, a number of well trained specialists, such as agronomists, geologists, engineers, foresters, and hydrologists. These specialists are required to help keep soil conservationists, working directly with farmers, fully abreast of the latest developments in the various technical fields, and to help train personnel required to do a good job—duly coordinated to fit the different parcels of land that make up farms and watersheds.

Take away from this national program of soil conservation any one of these techniques or technicians and you thereby weaken the conservation effort of the nation. You impair the effectiveness of the work. You retard progress. You jeopardize the chances of controlling erosion. Today, by using all the needed techniques, technicians, and specialists we are absolutely controlling erosion on a widespread scale.

Occasionally, some people who do not understand very well the requirements for achieving effective and lasting work propose that agronomists should not work on the soil conservation job because they are agronomists. Once in a while, the same kind of people will suggest that engineers should not be used because they have been trained to do strictly engineering jobs. They sometimes advance the idea that foresters should not be used because they have specialized in forestry in and out of college. If this kind of thinking should be followed—if you can't build terraces or plow on the contour because it's engineering, or plant grass because that's agronomic work, or plant trees or any other needed plant that grows on the earth because that kind of work would be forestry or something else—then there would be no practical way, no possibility of ever getting the job done.

If one skill is denied, why not deny the right to use other skills, technicians, or specialists, and so on, until you arrive at a point where nothing can be done?

You wouldn't think anyone would seriously consider such senseless emasculation of a highly successful going job, when it is pretty generally understood that the nation was a hundred years late in getting an effective national program under way—but ever so often, nevertheless, it still happens.

There is one way and only one way to do an effective job of soil conservation; and that way I have briefly described in this statement. This is not just a matter of opinion; it is a physical fact that has been unmistakably proved by far-reaching research and experience on the land.

New Dairy "Breed"

Farmers south of the Rio Grande are enthusiastic about a Brahman-Jersey cross being pioneered by the King Ranch in Texas. The cows are good milkers, even with moderate feeding, and able to stand the ticks and climate which make it tough on standard dairy breeds.

The male calves, unusually large at birth, make good beef as yearlings. Texas ranchers say that demand for breeding stock is far ahead of the numbers they can produce.

—*Farm Journal*

Plow To Kill the Borer

Condensed from Successful Farming

J. G. Gunning

It's clean plowing that seals the corn borer's tomb. At the University of Illinois, 98 percent of live borers were destroyed when crop refuse was turned under with the aid of coulters, jointers, and wires or trash shields.

Clean plowing is essential in corn-borer control because it not only buries the live borer and smothers the moth that might ultimately emerge, but it also destroys the breeding grounds of those live borers that may regain the surface. The coulter and jointer, first used on the old "sodbusting" plow, perform well in stalks and stubble. The corn borer and prairie sod are over half a century apart, but these same attachments that helped to break tough prairie sod and pull under the tall buffalo grass are today being used in borer control.

Today the purpose of the coulter in plowing cornstalks is essentially the same, and in addition it cuts stalks and stubble to a point where they can be covered up easily. The larger the coulter the more effective the job when plowing in corn-borer conditions. Small coulters tend to push the trash rather than cut it. Notched coulters, of more recent origin, provide increased traction when plowing under tough wet corn. The coulter should be set to cut one-half the depth of plowing and one inch wider than the landside. When the coulter clamp is adjustable, the coulter hub should be set one to three inches back of the point of the plow.

That old prairie plow that migrated west with our forefathers soon was to be encumbered with another attachment—the jointer—to cut a small, preliminary furrow in the heavy mat of grass just previous to the main furrow slice. It cut and turned under the grass at the outer edge of the furrow slice, preventing protruding wisps that might remain above ground.

Now this same attachment rigged to the tractor plow to control the corn borer performs the same function in the cornfield—throwing trash, stalks, and stubble into the bottom of the furrow with a twist, where they are covered by the main furrow slice. Unfortunately, many of the jointers once in use were discarded as troublesome, trash-collecting headaches. The easy way out of this situation is to obtain a

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modern, combination coulter, and jointer which involves little or no adjustment for different field conditions.

Just in case you do run across the standing coulter that worked so well a few generations ago, note the following adjustments that are still quite workable: The jointers should be set to cut 2 to 3 inches deep, with the point of the jointer from 3/16 to 1/4 of an inch away from the coulter blade, when the plow is out of the ground. That small amount of clearance allows for the spring in the jointer arm caused by the pressure of the soil against the blade. The space between coulter and jointer should gradually increase from the point of the jointer upward, allowing a V-shaped area of clearance between the two which releases trash that might be inclined to clog or drag.

"Weed hooks" and chains were used on the old walking plows to pull down and hold down the tall buffalo grass until it could be covered by the main furrow slice, eliminating "eyebrows" of grass sticking out between the furrow slices. Today, wires, 10 and 12 feet long—of No. 9 strength—are recommended for plowing under standing cornstalks or corn that has been hogged down. Such wires pull down standing stalks and hold them, under tension, to the bottom of the furrow, until they are covered completely. Wire ends, are of course, held down by the turned earth.

The number of wires needed and their attachment has caused considerable debate. Generally speaking, the first wire should be attached to the coulter shank, threaded thru the coulter yoke and underneath the coulter-bearing bolt. This allows the wire to swing free and clear on headlands. A second wire can be attached to the extreme tip of the coulter shank, and a third wire of increased length can be attached to the drawbar of the tractor hitch.

If you still retain that old walking plow for garden work, or for hilling potatoes, take a good look at the long, low, extended moldboard with very little pitch. Modern moldboards have been shortened, with the pitch or curvature increased more or less to throw the cultivated soil a greater distance at present-day tractor speeds.

Moldboard extensions are a somewhat modern innovation to extend the length of moldboards on the tractor plow. They give the furrow slice an extra kick to lay it over completely, and they eliminate the open-faced furrows and protruding stalks and stubble that provide avenues of escape for borers that may have been plowed under. In heavy cornbelt soils or where a slow plowing speed is

necessary, moldboard extensions perform a vital service to borer control.

It would be unfair to assume that clean plowing with the above attachments is the only factor necessary in plowing to control the corn borer. Depth and season of burial are both factors that influence the mortality of borers, but clean plowing can *control* the corn borer and curb its damage to an extent to which we can live with it. The European corn borer is a real challenge to the plowing ability of corn-growing farmers.

Late planting and well adapted hybrids complete the recommendations now generally offered for borer control.

More Dollars from the Turkey Breeders

Condensed from The Southern Planter

Edward W. Glazener
University of Maryland

Since the price of poults has been relatively high the last few years, the turkey breeder is interested in securing as many hatching eggs as possible during the season. More early eggs can be obtained by shortening the period of time required for sexual maturity by using artificial lights.

Last year, turkey hens in the Maryland Experiment Station flock were in production approximately 6 to 8 weeks earlier than the previous year by the using of artificial light. More than 15 extra eggs per hen were secured for the early hatching season. At turkey egg prices common in this area, this increase represents an added income of approximately $7.50 per turkey hen. Also, early poults are desirable as they tend to grow and live better than the late-hatched poults.

Hens that are mature at 28 weeks of age usually come into production about one month after the lights are started. Some hens will come into production in less than this time, and others will require a longer period. Toms appear to be slower in sexual development than hens, requiring exposure to light a month earlier to insure high fertility of the early eggs. This means that the toms to be used with hens that are 6 to 7 months old in December should be exposed to light in November to insure fertility of the eggs laid in January, if the lights are started on the hens in December.

Bright lights are not necessary.

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Dim morning lights that add enough illumination to the regular day to provide about 14 hours of light are desirable. The lights, however, need to be bright enough so the hens can find the feed and water.

In preparing the house for lighting, suspend the light sockets in the middle of the house from the roof. One 15-watt bulb is needed for each 200 square feet of floor space.

Ramie . . . A New Marvel Crop

Condensed from Farm Journal

Wheeler McMillen

Down in the Florida Everglades a few weeks ago I saw growing on more than a thousand acres what may be the most sensational new crop since the soybean. I saw another thousand acres or more of land prepared for further plantings.

Two $150,000 factories for processing the crop were going up. Close to $100 will be spent on growing each acre before a stalk leaves the land. Behind this investment are two of the nation's best-known industrial companies.

The crop is *ramie,* and the product is a fibre of amazing qualities. From perennial roots the nettle-like stalks shoot up four to seven feet. After cutting, more stalks promptly grow again, so that in two months or less another crop may be cut. Three crops a year, at least.

Inside the inner bark lie fibers from 5 to 20 inches long. They appear to do more things well than any other natural or synthetic textile material. They can be spun or woven, alone or blended with other fibres, on machinery now used for cotton, rayon, silk, or wool. When woven with wool, ramie prevents shrinking. Ramie fabric absorbs perspiration and other moisture easily, dries quickly, washes well, resists mildew, and permits removal of the most difficult stains. A man who was wearing what I took to be a new shirt told me that it had been laundered sixty-five times.

The fibre is eight times stronger than cotton and silk, and as elastic as cotton. When wet it is a half stronger than when dry. It gives off no lint, takes commercial

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dyes well, and holds color better than other fibers.

Where has this miraculous fiber been all our lives? Mostly it has been in South China, and so wrapped up in gums and pectins that no one has known how to get it out clean. A Chinese, industriously pounding the stalks with a stick, did well to produce four or five pounds of gummy fiber a day. The spectacular qualities of the fiber have long been well-known to textile experts; so well, indeed, that fortunes have been spent trying to invent decorticating machines. I am told that the British Government, 60 or 80 years ago, offered a cash prize of several thousand pounds for such a machine, and then withdrew the offer when only failures appeared.

I have not seen the machine that now decorticates and degums the ramie stalk. However, the people responsible for the Florida acreages I saw growing, and for the mills I saw building, have not spent hundreds of thousands of dollars with the idea that someone will pound ramie stalks with a stick. I understand that the successful machines are similar in principle to those used for hemp, but that the stalks are processed green, while heavy jets of hot water wash out the gums.

Ramie will grow in suitable soil wherever the frost reaches down less than two or three inches. Experimental fields can be seen in Texas, Alabama, and Georgia. Once planted, the stand is good for four years or more, until the roots choke up all the space between rows. Good cultivation yields from 500 to 800 pounds of fiber per acre yearly.

The biggest yields may be expected in the frost-free muck lands of the everglades. But that area is quite limited. Once the markets get a real taste of this extraordinary fibre, demand may be terrific. I am only guessing that it may well be great enough that ramie will soon be creeping along the lower edge of the cotton belt.

During the war the Navy bought all the ramie obtainable for packing stern tubes. Industrial users may consume much of the crop, until enough is grown to supply the textile markets.

No one knows the future price. Pre-war it was about forty cents a pound. Even though their yields were lower, a good many farmers might find ramie a better crop than cotton, and certainly a less laborious one. That would cut the cotton surplus.

Ramie leaves contain more protein than alfalfa, and double the fat content, which may mean something to southern livestock.

How They Make Money

Condensed from The Farmer

E. F. Ferrin

Secretary, Minnesota Swine Producers' Association

THE Honor Roll project records show very clearly that efficient hog producers do not takes chances in selecting brood sows. Litters of pigs were marked, or at least those with a large number of strong, uniform pigs. When the pigs were weaned, certain litters were spotted as furnishing the best future seed stock. In this way the ability of a sow to farrow, nurse and care for a bunch of big, husky pigs was carried over to later generations. Some of the producers made doubly sure of the right selections by weighing the litters of pigs at 56 days of age.

Buying boars was done just as carefully as the brood sows were selected. All the Honor Roll men bought purebred boars of a fast growing, thick, early maturing type. Several stated that they never haggled about the price of a boar when one was found that suited them. Getting a boar from an outstanding litter was important and boars from weight-tested litters were used in several herds.

Two methods were followed in feeding the brood sows during the winter season; most of the herds were hand-fed but several of them were self-fed. Alfalfa hay or meal at the rate of 20 to 30% by weight was included in nearly all of the rations along with corn and oats. In nearly all cases oats was emphasized by the statement that limited amounts of corn were fed especially late in the gestation period. A protein concentrate and minerals were always fed. The grain allowance was varied according to the gains made by the sows. If the sows were getting too fat, either the proportion of corn was reduced with an increase in oats or the total feed of grain was lowered. As an average, from 2 to 2½ pounds of feed was given per day for each 100 pounds of weight of the sows.

The ration used for self-feeding brood sows was typically equal parts of ground corn, ground oats and alfalfa meal plus about 10% of protein concentrate and minerals. One of the variations from the self-feeding plan was to change to hand-feeding about two weeks before the sows were due

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to farrow. Water was supplied in fountains protected from freezing in cold weather. Most of the producers emphasized the value of exercise for brood sows which was obtained by having the quarters for sleeping and for eating some distance apart.

The equipment for the farrowing season varied from new modern barns to movable houses. Early pigs were farrowed in central hog barns and later litters usually were born in small one or two-sow houses. One of the larger producers who handled his pigs with a minimum of labor distributed one-sow houses on the alfalfa pasture. The pigs came from May 12th to May 25th so the pregnant gilts were on pasture and had corn, oats and a protein mixture of one-half tankage and one-half soybean oilmeal in self-feeders. The feed was always accessible to the gilts, even the day they farrowed which is contrary to the practice of limiting the feed as most producers reported. The common plan of feeding sows at farrowing time was to withhold feed but give water for the first 24 hours. The first feeds allowed were oats or bran. Corn was not given for several days.

Farrowing pens were cleaned by scrubbing and disinfection. Most of the men who used barns with concrete floors cleaned them with lye and hot water and washed the sows before putting them in clean pens. After the pigs were a few days old, two or three litters were sometimes run together, but the majority of the producers preferred to keep litters separate as long as possible.

All but two of the producers castrated the boar pigs before weaning; the age of the pigs ranging from two to seven weeks. More than half of the owners had the pigs castrated by the time they were five weeks old.

There were more small herds, from 8 to 12 sows, following the plan of early farrowing than larger herds. Marketing of the February and March pigs began in August or September and was generally completed by the middle of October. These early pigs were full-fed to push them for quick marketing. Some men had an early bred group of sows and another bunch for later farrow to get full use of limited farrowing equipment. This plan made more of a problem with pastures when the two ages of pigs were kept separate.

Rotated, clean pastures were generally used by the Honor Roll producers except three who raised the pigs on concrete. More than one-third of the farms made use of alfalfa pasture on clean ground, allowing a lapse of two or more years before the pigs were again on the same pasture area. In two cases only one year intervened

between use of the same pasture. Brome grass and alfalfa in pasture mixtures were highly recommended by three farmers. Clover, blue grass and mixtures including rape were used on a total of five farms.

The men who raised pigs on concrete were not among the larger producers, having 8, 11, and 13 sows respectively, farrowing in the spring of 1945. Each of these three men marketed the pigs early when they were from 5½ to 6½ months of age at weights ranging from 202 to 226 pounds. The concrete raising plan was adopted to prevent worms and necro infection in the pigs and it was emphasized that the floors must be kept clean or sanitary conditions are worse than on pasture.

The Honor Roll project was sponsored by the Minnesota Swine Producers' Association which was enthusiastically supported by the Extension Service, *The Farmer*, and business interests which put up the necessary money.

Sweet Clover Need Not Be a Weed!

Condensed from The Dakota Farmer

Ray Antonen

WHEN properly managed, sweet clover is the best legume soil builder which the South Dakota farmer has but, when not handled wisely it becomes the farmer's enemy, says U. J. Norgaard, extension agronomist.

"If sweet clover comes up as a volunteer crop and infests cropland, it just isn't being handled right," Mr. Norgaard said.

Farmers generally plant sweet clover with good intentions of utilizing its capacities as a producer of hay and pasture while it is growing and as a soil builder when it is plowed under.

Plowing under sweet clover adds valuable quantities of nitrogen and organic matter to the soil and sweet clover is a mainstay as a legume in crop rotations for South Dakota.

But because of its vigorous ability to grow, its adaptation to our soil and the fact that its seed lives a long time in the soil, sweet clover will grow voluntarily and become a weed in our cropland unless it is properly managed.

The time to plow cropland, on which a first-year stand of volunteer sweet clover is to be controlled, is early in the fall or late in the spring.

The key to the date of plowing is the formation of winter buds, which the farmer may see by digging near the crown of the stem just below the surface of the ground, and the development of large, fleshy tap roots in which the plant stores food nutrients to give the buds a quick start in the spring.

In the first-year sweet clover plant, the movement of food nutrients is a two way traffic between the roots and the top growth. In early spring and summer the food nutrients move upward and are utilized for top growth while during late summer and early fall the flow of food is downward for use in developing the large, fleshy roots and winter buds.

Here is what happens if the plowing is done late in the fall after the winter buds and large roots have developed:

The plowing simply transplants the sweet clover and it starts to grow again, in the spring.

The same effect is produced if the plowing is done early in the spring.

But if the plowing is done early in the fall—anytime before the early part of September—the sweet clover will be turned under before the winter buds and large roots have formed and the plant will lose its capacity for getting started in the spring.

And also if the farmer waits until late spring before plowing the clover—just before corn planting time, for instance—the clover can be killed, providing that a thorough job of covering is done.

The roots and buds at this stage have produced a top growth of 6 to 12 inches and the roots have been weakened by the loss of food nutrients.

In fact as Mr. Norgaard points out, this late spring plowing system is used by many farmers who plant sweet clover in their rotation as a soil builder. Maximum fertilizer value is obtained from the clover when plowed under when the top growth is from 6 to 15 inches tall and figures released by the U. S. Department of Agriculture reveal that sweet clover plants contain about 80 per cent of their maximum quantity of nitrogen at about the first of May.

When plowed under in the spring, following the year of seeding, a good stand of sweet clover will add to the soil as much organic matter and nitrogen as 5 to 8 tons of average stable manure.

By observing the development of the winter buds in the fall, along with the formation of the big roots, the farmer can judge for himself if it is too late to plow fields which have been infested with first-year volunteer sweet clover. The buds may easily be seen by digging into the ground just at the crown of the stem.

If the buds are there, it is too late to plow that fall with the idea of killing the clover. The only alternative would be to wait until spring and put the land into corn or even some later crop.

This system of plowing for the control of sweet clover fits into and encourages good plowing practices.

Early fall plowing is recommended for small grains and late spring plowing is a good weed control practice when planting the land to corn, soybeans, and other cultivated crops, and also for summer crops such as proso millet or buckwheat.

South Dakota farmers who have learned the trick of sweet clover management are loud in its praise as a soil builder.

Rust, Saboteur of Machinery

Condensed from The Ohio Farmer

Julian M. Snyder

WE ASKED a group of practical farmers scattered over the country and some 30 agricultural engineers about the problem of rusty farm machinery.

A pithy comment summing up the farmer's rust problem came from a mid-western farmer who said: "Rust causes loss of time, repairs and a lot of cussing."

But these losses in time, temper and money are now easily avoidable. Agricultural engineers at Illinois, Purdue and other agricultural colleges have been running tests of "rust preventives" and they have found several new rustproof compounds.

At the University of Illinois more than 30 so-called "rust preventives" have been under test on farm machinery and metal strips exposed to the weather, for nearly two years. A few of the new compounds are still giving perfect rustproof protection on moldboards after 16 months, according to Agricultural Engineer R. I. Shawl.

He states: "Rusting is prevented by these new preventive compounds because they adhere firmly to the metal surfaces and form an elastic, non-porous film through which moisture and air cannot penetrate. The compounds will prevent rusting even if applied over moist or wet surfaces; and when applied over rusted surfaces, they will stop further rusting and loosen up the rust already present."

These compounds are easily removable and have some lubricating qualities.

Further, Professor Shawl found that when these new rustproof compounds were diluted sufficently with kerosene or white unleaded gasoline to be usable in an ordinary insect spray gun, they gave four to six months' protection on machinery stored outdoors and more than a year's protection on machinery stored under cover.

This "spray method" of rustproofing offers the first practical answer to the problem of preventing rust on those "hard-to-get-at" parts of farm machinery such as the inside metal work of combines, cutter bar knives and ledger plates, chains, gears, slip clutches, knotters on binders, etc.

The results of the 16 months' all-weather tests of rust preven-

tives conducted by agricultural engineers at the University of Illinois follow:

Crankcase and transmission oil —7 to 30 days' protection.

Axle and pressure gun grease— 60 to 90 days protection.

Five rustproof compounds— 276 days' protection.

Nine rustproof compounds— 365 days' protection or more.

Studies conducted in Iowa show that outside the tractor, truck and windmill, the average piece of farm machinery is used only 11.1 days a year. It has 50 weeks at the mercy of the weather.

A survey of 438 farms in New York State showed that although the machines lasted for years, their average work - life was very short. For example a corn binder did only 55 10-hour days in its lifetime; a limesower 43 days; a dump rake 48 days; a hay tedder only 16 days' work. The longest work-life revealed by the survey was the plow with 180 days.

Naturally the size of the farms and the amount of uses given each machine annually had an effect upon the number of work days recorded for each machine. But the important fact revealed by the survey is that farm machinery "wears out," not in proportion to use, but in proportion to time. In other words it rusts out.

A few of the comments on the importance of rustproofing farm machinery, by agricultural engineers follows:

"Five minutes spent applying an effective rustproof compound to a plow or a disk will save several hours of irritating work getting these tools to scour.

"Rust is the greatest enemy of the plow. Rusty moldboards mean bad plowing, imperfect seed beds, and scanty yields.

"Rust on sprockets, chains, bearings, slip clutches may cause more wear in the first hour of operation than will occur in the whole season.

"Rust damages farm machinery having steel sheets. Steel grain drills, steel manure spreaders and combines should not be allowed to rust or the entire machine may have to be scrapped years before its normal life.

Blower Mows Away Long Hay

Condensed from Electricity on the Farm

Paul R. Hoff

Extension Agricultural Engineer, Cornell University

BLOWERS have been used as conveyors for many materials, but it remained for a group of farmers in western New York to be the first to put long hay into the mow with a blower. The idea started several years ago with Mr. A. I. MacDuffie of Pavillion Center, New York.

One day while he was using an old threshing machine to blow combined straw into his mow, he began to wonder why he could not blow hay into the mow too. Following his hunch, he removed the blower housing, fan and wind stacker pipe from the threshing machine and set them up on a stand on the barn floor. Power to operate the blower came from his tractor, and he brought the hay to the blower with his buckrake.

The following year several of MacDuffie's neighbors built similar hay blowers from the wind stacker parts of old threshing machines and the idea spread from there. In some neighborhoods the supply of discarded threshing machines was soon exhausted. In preparation for the 1945 hay harvest, several manufacturing companies in western New York built blowers especially for blowing long hay into the mow.

The usual procedure is to remove the blower and the blower housing intact from the old threshing machine and to mount this assembly on skids so that the machine can be moved about. One of the commercially built blowers is equipped with a pair of wheels so that it can be trailed behind a truck or tractor. It is necessary to build a hopper shaped feed table in front of the fan opening so that the hay can be fed to the blower without danger of getting a pitchfork in the fan blades. Although most blowers are used with the same size and shape of feed opening as was on the old threshing machine, several users have enlarged the opening so that the hay enters the fan housing lower and to the left (nearer the blower pipe). This change in the feed opening increases the amount of hay that some blowers will handle.

Most of the blowers have been

used to mow away long hay that was field cured. Some of them because of their design will not handle hay that is not well cured, but others will blow hay with as much as 30 to 35 per cent moisture into the mow. (Hay with this moisture should be put into a mow only where there is a mow curing system). Green hay tends to clog the blower pipe or to wrap around the fan blades. Blower pipe clogging occurs less often with a 14" or a 16" diameter pipe, although one owner of a commercially built blower having a 12" pipe successfully filled his mow drying system this last summer with hay that he estimated contained 35 per cent moisture. At least part of his success in putting partly cured hay through his blower was due to feeding the machine evenly. Wrapping around the fan blades seems to occur more frequently on some blowers than on others. Several users have prevented wrapping by attaching a large disk from an old disk harrow to the fan hub, with the convex surface facing the feed opening. Best operating speeds seem to be 800 to 1,000 revolutions per minute, although an occasional blower could be found running 1,100 to 1,200 rpm.

The men who are using a blower to mow away their hay and who are bringing the hay to the barn with a buckrake report that they are able to bring in hay with less labor and in less time than they were ever able to with a hay loader and wagon or a truck. Some farmers report that they save as much as 50 per cent of the time and labor formerly used, and reports of saving a third of the time are common. The usual hay crew is only two men—one on the buckrake and the second man pitching hay into the blower. No one is needed in the mow because the hay can be well distributed by moving the stacker pipe to direct hay into every part of the mow.

Hay blower users generally agree that the physical effort involved is less than they ever thought was possible. Several factors are responsible. First, the man in the barn is working on solid footing, because he stands on the barn floor or on the ground while he is pitching hay into the blower, instead of climbing around on loose hay in the mow. Second, buckraked hay is loose, and it does not need to be torn apart to be pitched into the blower. Hay brought into the blower on a wagon is hard to pitch in and the job goes more slowly; the saving in time and effort is not as great as it is with a buckrake.

Up to the present time, the blowers used to mow away long hay have been made from old threshing machine parts or have been manufactured by companies

making threshing wind stackers. Generally, tractors have been used for power, but experimental work with a blower powered with a 7½ horse power electric motor indicates that as soon as a more efficient blower is designed for this job, here is another use that can be made of a portable farm electric motor.

Nation's Top Victory Gardener

News from The National Victory Garden Institute, Inc.

THE National Victory Garden Institute has chosen Jim Brown, 106 Kener Avenue, Nashville, Tennessee, as the best Victory gardener in the United States in 1945 and to him was given the highest Green Thumb Award of the Institute, a $1,250 Victory Bond. In addition, Mr. Brown won state and local awards for his outstanding production from a 100 to 150 foot garden.

The Green Thumb contest was sponsored on a nation-wide basis by the Institute to stimulate Victory Gardeners to do their utmost to grow and conserve for home use. Contestants were required to enter a record book telling the complete story of their gardens.

The Brown "farm" consists of one acre of land which supplies Mr. and Mrs. Brown and their three and a half year old daughter with just about everything needed, with the exception of items which the soil will not yield, with the result that their grocery bill averages only $16.00 a month. In fact, their total net cash expenditures are only $55.70 a month. Mr. Brown works five and a half days a week as a clerk in a railroad office, at $200 a month, but finds time to devote many hours to his garden. In addition to vegetables, the garden provided peaches, apples, plums, grapes and berries. The Browns keep a cow and seventy-five chickens and the surplus of milk, butter and eggs is sold.

Mrs. Brown canned 118 jars of fruit and 572 jars of vegetables in 1945. Some of the 1945 vegetable yields were: 40 bushels of tomatoes, 900 pounds of cabbage, 40 bushels of lettuce and 15 bushels of lima beans. More than 100 friends and relatives received surplus vegetables, as the Browns will not sell them.

The Browns are practically self-sufficient from their golden acre. They fare better than many families with ten times their income. They estimate that their garden saves them between $600 and $1000 a year.

In addition to vegetables and fruit the Brown garden grew 50 varieties of flowers. Window boxes and pots are filled with flowers and house plants which are wintered in a small greenhouse. Among these plants is a dwarf orange tree that bears 100 fruit each year.

In answer to what the average gardener should do to secure good results, Mr. Brown lists the following: He should carefully prepare soil; select good seed; plant by directions at proper time; cultivate regularly after each rain; keep constant watch for insects and disease and make certain to irrigate in dry weather.

Mr. Brown uses manure, compost, cover crops and other organic matter. In addition he applied 900 pounds of four different commercial fertilizers. The growing season in Nashville is about eight and a half months, but there are only six and a half months of really frost-proof weather. Tender plants are started in the green house and in cold frames.

The Browns are no mere wartime gardeners. They have had their place for seven years. Both Mr. and Mrs. Brown have rural backgrounds. Mr. Brown started gardening as a child, and at the age of sixteen, gave his future wife a watermelon he had grown. Her expert farmer father pronounced it "the finest melon he had ever eaten."

Why Hog Profits Vary

Condensed from Iowa Farm Economist

Six reasons proved most important in deciding profits or loss in hog production on a group of Minnesota farms studied by the Minnesota Agricultural Experiment Station. These 142 southern Minnesota farmers kept complete records of their hog production enterprises from 1928 through 1937.

The six main reasons that seemed to spell the difference between profit and loss in pork production were: The number of pounds of feed a farmer needed to produce a hundred pounds of pork; the percent of protein he fed in the ration; the amount of sanitation he practiced; his hog death loss; the number of pigs he weaned per litter; and the relative price he received when the hogs were marketed.

The best group of feeders in

Reprinted from Iowa Farm Economist, Ames, Iowa

this group were able to market 100 pounds of hog with an average of 352 pounds of feed. The poorest feeders had to shovel out 864 pounds of feed to produce 100 pounds of pork.

This means that the BEST feeders had a return of $2.98 above feed cost per 100 pounds of pork produced even during those years when prices were low. At the same time the POOREST feeders had a feed loss of $2.03 per 100 pounds of pork produced.

The best feeders had lowest death losses. They also weaned more pigs per litter.

In this study, the most profitable level of protein feeding for hogs was 15 percent.

When more protein was fed, profits were less because of higher feed costs despite the fact that less grain was used in total. With lower levels of protein feedings, the average cost per 100 pounds of pork produced increased because more feed was needed to make the same gains.

Sanitation proved almost a necessity in getting greater returns. Farmers who followed the most important steps of the clean ground system of raising hogs had an average return over feed costs of 30 cents more per 100 pounds of pork sold than those who did not take these precautions.

What's more, those farmers who took the most care in following sanitary practices in raising hogs on clean ground also had the lowest death loss. The importance of holding down death loss is shown by the fact that it took 30 pounds more feed to produce 100 pounds of pork on those farms with a high death loss than on the farms with a low death loss.

Naturally, the time of year when the hogs are marketed affects net profits. When hogs are sold at the peak of the fall and winter rush, the profits above feed costs probably will be less than for hogs sold in the late summer, even though the same quantities of feed are used. However, individual farmers have to take into account their own limitations on equipment, labor and available feeds. These limitations actually may make it more profitable for some farmers to sell at the lower markets of the year.

Adapted from bulletin by T. R. Nodland and G. A. Pond, Minnesota Agricultural Experiment Station.

Swine Sanitation Essential for Thrifty Pigs

Condensed from American Hampshire Herdsman

L. A. Weaver

PORK producers generally are conversant with the fact that the cost of feed is the chief item of production expense and that there is a wide variation in the amount of feed required to bring different droves of hogs to a marketable weight. There are, of course, a number of factors which contribute to economical production but among these the general thriftiness of the fattening pig is of particular importance. In fact, there is little question but that lack of thrift is responsible for the greatest loss sustained by pork producers, although such losses may not be so noticeable as those due to disease which may actually cause death.

Internal parasites are the greatest single contributing factor to a lack of thrift and the common intestinal round worm is one of the most injurious of the various kinds of parasites that infest the pig. Such infestations cause digestive troubles, retard growth and development and in other ways interfere with the well being of pigs, especially the younger animals. Efficient worm treatments may rid older hogs of intestinal worms but serious injury which persists throughout the entire pig's life can be prevented only by keeping young pigs from becoming infested since investigations have shown that this parasite can cause a great deal of damage other than merely as an intestinal parasite.

In its early stages of development in the pig, and while still too small to be seen by the naked eye, the worm travels in the blood stream from the intestine to the lungs and then back to the intestine by way of the windpipe and esophagus. This curious journey requires about 10 days for its completion, after which the young worm settles down in the intestine and grows to maturity in about 2½ months. If many of the young worms take this trip at the same time, as often happens, the injury that results is likely to be serious. Pigs that survive a severe invasion of the lungs by the young worms frequently do not recover fully and fail to grow and develop at a normal rate. Bacterial complications, often with pus production, sometimes follow

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the invasion of the lungs by the young worms, and these infections share the responsibility for stunted growth of pigs. It has been repeatedly shown at the Missouri Station that even though later the round worms are eliminated from the intestial tract, that such pigs never make satisfactory gains even when fed and handled in the best possible manner. Post mortem examinations have shown no intestinal worms but much of the lung tissue was impaired to such an extent that the animal was unable to consume, digest and assimilate sufficient amounts of feed.

Investigations and experiments have also shown that pigs are most susceptible to infection and suffer most seriously from the infection during the first few weeks of life. As they grow older they become more resistant, have fewer worms, and suffer less from both the young worms in the lungs and the older ones in the intestine. Little pigs, therefore, require special protection.

Pigs become infected by swallowing the eggs of the parasite. These worm eggs are of microscopic size and are found in the manure of infested hogs and in the soil of places that have been occupied by hogs. At the time they are passed out of the body of the hog in the droppings the eggs are not infectious. But in a few weeks or months, depending on the weather and various other conditions, the egg develops to a stage in which it contains a tiny worm, and it is then ready to infect the pig which swallows it.

As a result of constant use of the same fields and lots by hogs it is obvious that unless special precautions are taken pigs may become infested within a few days or even a few hours after birth.

The McLean County system of swine sanitation as worked out by the U. S. Department of Agriculture and farmers of that Illinois County, if properly used, is not only effective in preventing round worms but is also the best known method for the prevention of other parasites, as well as many filth-borne diseases such as necrotic-enteritis, bull nose, sore mouth, and certain forms of diarrhea.

Essentially, the swine-sanitation system consists in handling young pigs from the time of birth until they are several months old in a manner that avoids or reduces to a minimum the chances of infection with worms, or, in other words, that keeps young pigs entirely away from old hog lots or other places exposed to fecal contamination. The important steps in putting the system into operation are as follows:

1. Clean farrowing pens thoroughly, and scrub them with scalding water and lye. Use one pound of lye to ten gallons of

boiling water. The lye helps remove the dirt and assists in penetrating the egg so that the boiling water can kill the immature worm inside. Disinfectants have little or no effect on the worm eggs, but help in ridding the pens of lice and mites.

2. Wash the sides and udders of the sows, with warm water and soap, before placing them in the clean pens. Care should be taken to brush them dry in extremely cold weather.

3. Move the sows and pigs out to clean pasture, two weeks after farrowing. It will be best to haul the sow and pigs when it is necessary to cross infested areas.

4. Keep the young pigs on the clean ground until they are four months old. After that they do not seem to be harmed by the worms, and may be put back in the bluegrass lots, if the shade and water are better there than in the clean fields.

Records kept by Missouri farmers show that it is very important to carry out each step of the plan just outlined and that it is difficult to secure good results unless all steps are followed. For example, in Holt County 80 per cent of farmers who practiced all four steps in the plan were able to market their hogs at a weight of 200 pounds at approximately 6 months of age. Sixty-one per cent of those who followed three of the steps were successful, 22 per cent when two steps were followed, while only 3 per cent of those keeping records reached the desired goal when only one step was followed.

Records kept by these farmers show further that not only are pigs more thrifty when raised under the best conditions of management, but fewer sows need be kept to produce the desired number of pigs since those practicing the plan of growing thrifty pigs raised approximately 2 more pigs from each sow in the herd.

Breeding Fowls with All-Round Excellence

Condensed from Pacific Rural Press

Horace Dryden

It has been amply demonstrated that almost everything relating to a chicken's physical characteristics and behavior is influenced to an important extent by its inheritance. Some characteristics depend for their expression entirely on heredity and are not influenced in any manner by the environment, while other hereditary factors are expressed or seen only in the presence of a special environment. In such cases it is said that an hereditary "predisposition" exists. Thus, for all practical purposes we can assume that almost everything that a chicken is, and that almost everything it does or doesn't do, is influenced in more or less degree by its heredity.

Since the behavior of a chicken is influenced to such a great extent by the behavior of its ancestors, the opportunity in pedigree poultry breeding is very great. Accurate and skillful selection can result in the production of stock of superior quality and of great value to the poultry industry.

Results at the California Official Egg Laying Test, where detailed and accurate records of actual net income over feed cost have been kept for several years on each entry, show that the profits in commercial poultry production can be high when the stock is of good quality and proper environmental conditions are provided. The California records have demonstrated, however, that these profits depend to an important extent on a number of hereditary factors in addition to rate of annual production. These include seasonal production —the time of year at which the eggs are laid, the way the eggs grade commercially—egg quality, feed consumption and mortality. While the annual egg record is one of the most important factors affecting profits, it is by no means the only important factor. The pen that made the most net income and won the Fourth California Test was actually outlaid by a considerable margin by three other pens.

But the winning pen had the highest "batting average" in all of the factors which make for success in poultry raising. It can thus be readily appreciated that the task of the modern poultry breeder is a complex and difficult

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one requiring extensive facilities and equipment and a high degree of experience and skill in the useful application of proven genetic principles. It will also be seen that the poultry breeder has a unique opportunity to be of service to the poultry industry if he will undertake a broad breeding program and not confine himself simply to improvement in rate of production.

While all poultrymen today agree that rate of production is an inherited characteristic, it is not so generally understood that almost all of the other flock characteristics have an hereditary basis. For example, millions of dollars are wasted by poultrymen annually on vitamin and mineral supplements to mashes in a vain effort to improve shell texture of eggs when the kind of egg a hen lays is determined almost entirely by heredity. Cannibalism is a major source of loss in the poultry industry, and large sums of money are spent annually on "specs" and other anti-cannibalistic devices. But breeding records on the Dryden farm have shown that cannibalism also has an hereditary basis and that it is possible to breed chickens who will behave in a "civilized" manner.

What good, then, is a hen with the genetic composition to make a high record if she hasn't the inherited ability to resist disease and parasites and the constitution to live more than a few weeks or months in the laying house? What good is high production if the eggs are thin-shelled and unmarketable? What pleasure is there in poultry raising if the flock is by nature high strung and nervous and requires the utmost care to prevent scaring and flying? And what good are strong constitutions, high production, good egg quality or anything else if the flock is going to destroy itself by cannibalism? These questions should be honestly faced by breeders.

Inheritance is not a simple, but a highly complex process. Even today the exact mode of inheritance of many commercially useful qualities in poultry is not known. We do know, however, that they are inherited. The inheritance of some characters is due to the presence in the sex chromosomes of the male or female cell of what are known as dominant genes. Other characters are due to recessive, complimentary, sex-linked or other types of genes. Always these genes, except when mutations occur, behave on combination in a precise mathematical fashion and any breeder who is thoroughly familiar with the genetic background or constitution of a mating can predict with a certain degree of accuracy the results in the offspring. The necessity for family selection is shown by the fact that exception-

ally good individuals often carry hidden and undesirable genes which they themselves do not express but which may appear in one or more succeeding generations of offspring. The chance of good individuals carrying these bad genes, it has been shown, is greatly reduced if the entire family, including all full brothers and sisters, are good. The opportunity of the poultry breeder, therefore, consists mainly in finding good families and using them to the best advantage.

In any breeding program based on family performance it is important that sufficient matings be tested to find enough good families of the desired quality, and it is also important that the family size be large, preferably at least 12 full sisters, if the testing is to be accurate and if the results and averages are to be significant.

After the good families are once identified by means of carefully compiled records the breeder must depend largely upon his judgment to complete the selection. Best breeding results will never be obtained by dependence on record-keeping alone. Faster progress can be made when, in addition, each individual is carefully appraised as to type and general physical characteristics, qualities which are difficult to assess by means of records.

Breeding is an art as well as a science. It will never be an exact science, where the breeder by means of records and mathematical equations, only, will be able to achieve a maximum of success. Good judgment in determining methods and techniques, in choosing between birds of equal records, and skill and thoroughness in carrying out the daily tasks relating to the management of the flock will always be important.

The most careful and scientific breeding work that is being done today commercially in the animal world is with chickens. The large animals, such as horses and cows, reproduce in small numbers and are difficult to test. Family records of such animals as compared with those obtainable from chickens will always be meager. Poultry breeding provides a challenging opportunity to achieve progress in a limited time.

A New Way To Determine the Water Condition of Soils

Condensed from Texas Farming and Citriculture

MANY valuable crops in the Low-Rio Grande Valley and elsewhere have been seriously reduced in volume because of a lack of accurate moisture in the soil. An instrument has been developed by J. Thos. Rhamstine of Harlingen to provide such information, and a series of tests by Dr. B. S. Pickett of the Valley Experiment Station has indicated the usefulness of the instrument for this important purpose.

Determination of the time when citrus and other crops need irrigation has been subjected to study for several years, a main objective being to put at the disposal of the growers an instrument combining effectiveness with simplicity of operation. Most of the methods devised in the past for measuring water requirements of the soil have been complicated and the data they yield are subject to errors that need for correction the services of technicians.

The rank and file of farmers have been enabled to use the instrument in question with ease and precision by the adoption of the principal of heat conductivity of soils, which has been widely applied in the past by a type of machine commonly called a resistance thermometer, used to measure temperatures in many industrial operations. But to adapt such a machine to measurement of soil moisture it has been provided with certain electrical characteristics.

Most of the original studies in the development of the instrument were made in an endeavor to correlate the rate of heat loss with the percentage of moisture in the soil. A very large number of curves were developed which were characteristic of each soil but seemed to have little else in common. A part of the variation shown by the curves was found to be due to the physical condition of the soil. Fortunately, most of the initial work was done on soils with good physical structures such as are found under field conditions. It was also fortunate in view of later developments that this work was performed under relatively uniform temperature conditions. A careful study of the preliminary data showed that in all soil types there

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were certain definite similarities. The data indicated that with soils equally wet the machine response was the same. It was this discovery that led to the development of the machine under discussion, which can be used successfully in the field by any person of average intelligence.

In making the final tests, four soils differing widely, were selected. These were Willacy sand, Victoria fine sandy loam, Victoria clay, and Harlingen clay. The soils were found to have wilting points at 5.8 percent, 7.2 percent, 13.2 percent and 18.2 percent of water respectively. The wilting point is a term referring to the amount of water in a soil when plants growing in it wilt permanently under certain conditions. Unless plants in such a soil receive water immediately they will begin to die. Trees are not apt to wilt as quickly or die as quickly as other plants because the root systems are so much longer that they often have a few roots in parts of the soil where the water is above the wilting point.

The tests showed that the machine registered on its dial the same for each of the four soils at the wilting point—48. It gave comparable readings up to 2.5 times the wilting point and down to .7 of the wilting point. It is unlikely that data beyond this range would have any particular value to the grower.

The machine does not measure the salt content of soils and only measures the wetness of the soil when the soil is in a normal physical state. In puddled soils other factors come into play.

In determining the moisture content of soils by any of the standard methods and then using this information to determine irrigation requirements, there are certain systems which have been developed in other areas. The simplest is this: The entire area is sampled at depths of 6, 12, and 18 inches. This depth of soil always contains most of the active roots of crops, whether tree crops or vegetable crops. These data are carefully arranged so that future samplings can be compared with them. This may require one or more sample locations per acre. A careful survey during the first irrigation season will allow the operator to choose strategic locations for future sampling to determine when he will need to irrigate. The older methods required a great deal of additional work. The wilting points of the soils had to be determined, and so on. With this method the wilting point is measured by the machine and is the index which one would use in deciding when to irrigate.

High-Fat Dairy Rations Give Higher Milk Production

Condensed from Farm Research

J. K. Loosli and L. A. Maynard

In a series of experiments carried out at the Experiment Station at Ithaca, it has been found consistently that an increase in the fat content of grain mixtures fed to dairy cows results in an increased production of milk. Before the war most of our commercial dairy feeds carried approximately 4 per cent fat. Under wartime conditions, many of these mixed feeds have fallen to 2½ per cent fat. This report is a re-evaluation of the question of the importance of fat in dairy feeds. It is made in an attempt to determine whether the wartime rations were adequate or if an effort should be made to return to prewar levels of fat.

Studies on this problem have been in progress at this Station for about 18 years. The facts accumulated during these years are briefly summarized in Table 1.

From these data it is seen that in all of these experiments, more 4 per cent fat-corrected milk was produced on a high-fat concentrate mixture than on a comparable low-fat mixture. The milk yield has increased with little or no change in its fat content. The extensiveness of these tests and the uniformity of the results can leave no doubt that the differences observed are highly significant statistically.

The high- and low-fat mixtures were fed at levels calculated to furnish an equal amount of total digestible nutrients, and therefore a smaller amount of the high-fat mixture was fed. Even under these conditions the high-fat grain mixture resulted in the production of about 4 per cent more milk than did the low-fat mixtures.

It can be calculated on the basis of these studies that 100 pounds of grain mixture containing 4 per cent fat produces as much milk as does 104 pounds of a similar mixture with only 2 per cent fat. The observed advantage for high fat is small in terms of variations that can be brought about by improved feeding or breeding practices. But when it is realized that an extra pound of milk is produced by each cow every day just by having a little

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more fat in the feed, it becomes clear that the question is an important one. Extra fat in the feed means more milk for the market and increased profit for the dairyman.

In these experiments the additional fat has been supplied by natural feed ingredients. In the high-fat rations soybeans, cooked flax-seed, distillers' corn dried grains, and linseed meal, cottonseed meal, and soybean-oil meal, were used, all of which contained 6 to 8 per cent fat. Similar feedstuffs used in the low-fat mixtures have been processed by solvent extraction or reduced to less than 4 per cent fat by either hydraulic or expeller processes.

All natural sources of fats in the amounts tested appear to be useful, but when these same oils, after extraction, are added to the feed they have much less value. In fact experiments in our laboratory have shown that the addition of soybean oil or corn oil to soybean-oil meal in an amount equal to that found in the soybeans actually reduced the digestibility of the ration and lowered the milk production, as compared with a ration containing soybeans. For some reason the oils in natural feedstuffs are more valuable for dairy cows than are the same oils when added to the feeds.

It is important to bear in mind that the difference in milk production generally can be compensated for by feeding a larger amount of the low-fat grain mixture. The figures presented indicate that, as an average, a 4 per cent fat mixture is worth about 4 per cent more than one containing 2 per cent fat. Thus, the question appears to be purely an economic one as to whether the fat is worth more than the extra feed. In normal times it is usually possible to make a high-fat dairy ration at little or no greater cost than that for a mixture lower

Table I

Summary of the Increased Average Daily Yield of Milk on High-Fat Concentrate Mixtures in Comparison with Low-Fat Mixtures

Year	Fat in concentrate mixtures fed	Increased daily production of fat-corrected milk	
	Percent	Pounds	Percent
1928-29	0.7 and 5.8	3.30	9.0
1929-30	3.1 and 6.1	1.07	2.4
1930-31	1.0 and 7.5	3.54	10.4
1930-31	3.2 and 7.5	2.87	7.2
1931-32	4.1 and 6.6	0.97	2.7
1932-33	4.2 and 7.2	0.27	0.6
1936-37	3.4 and 6.3	0.62	2.8
1937-38	3.1 and 6.3	1.73	3.7
1938-39	3.1 and 7.1	2.02	4.5
1939-40	2.6 and 6.7	1.21	2.3
1940-41	2.0 and 4.4	0.07	2.8
1941-42	2.0 and 4.0	0.50	1.9
1942-43	2.1 and 5.6	1.80	5.5
1942-43a	2.2 and 5.9	0.73	2.7
1943	1.4 and 6.6	0.90	3.4
1944a	1.9 and 5.9	1.30	4.3
1944	5.9 and 10.2	1.30	4.1
Average	2.7 and 6.5	1.42	4.1

in fat. There can be no disagreement that fat has a higher energy content than carbohydrates and is worth more on that basis. Thus, within reasonable limits, the more fat a concentrate mixture contains the better it is, because it furnishes more total digestible nutrients per pound.

According to the consistent results at this Station, a feed containing more fat is also worth more per unit of total digestible nutrients. Thus, on both counts, dairymen are justified in giving preference to a mixture of higher fat content. To say what the preferred minimum level of fat should be or how much more the dairyman can afford to pay for a feed of higher fat content involves too many variables to justify any specific answers for general application. Such fine distinctions are not justifiable for fat any more than for protein.

The experiments at this Station, similar tests at the Ohio Experiment Station, and the experience of dairymen during the war all show that good milk production, even if not maximum yields, can be obtained on dairy grain mixtures containing only 2½ per cent fat. But a high-fat guarantee on the feed tag does mean more milk per bag of feed.

Lodge-Resistant Oats

One good reason why farmers have hesitated to add much nitrogen plant food to their oat ground is fear of lodging.

Now it appears that some of the new varieties, particularly the high-yielding Clinton, are able to "take" a lot of nitrogen and still resist lodging.

Of eight oat varieties tested at the Iowa Experiment Station for tolerance to heavy nitrogen applications, Clinton headed the list. At 40 pounds per acre, Clinton, Benton, and two experimental varieties not yet released, stood up well. But at the 80-pound level, only Clinton could be harvested.

Yields jumped 10 to 13 bushels an acre when 40 pounds of nitrogen were used, and little if any more with 80 pounds.

Oats respond well to nitrogen, especially in cold, wet springs.

—*Farm Journal*

The Functions of Organic Matter in the Soil

Condensed from California Cultivator

J. E. Greaves

Utah Agricultural Experiment Station

THAT there is a relationship between the organic matter of the soil and its productivity has been recognized for centuries. Virgin soils are highly productive and they decrease in productivity as they are cultivated and there is a corresponding decrease in their organic content. Both factors decrease rapidly at first and, as time goes on, they decrease more slowly and are intimately associated with the microbiological processes of the soil. Hence, any permanent system of agriculture must maintain the organic matter of the soil. The functions of this organic matter are eight-fold:

Organic matter in its various stages of decay gives to soil its dark brown or black color. The absorption of heat and consequently the temperature of a soil depends to a marked degree upon its color. The microbiological activity of the soil is a function of its temperature which in turn is a function of its productivity.

The decay of fresh organic matter generates heat and this, at times, may be sufficient to increase the temperature of the soil. Albrecht calculated that an acre of the better corn belt soils in Iowa produces each hour, owing to the decomposition of organic material, sufficient heat to convert 17 pounds of water into steam at 100 pounds pressure.

Organic matter changes the structure of the soil. When added to a light or clay soil it tends to spread the particles thus causing the soil to increase in volume. This increases the pore space and hence the quantity of oxygen entering, and in this manner aerobic microbial activities are increased. Partly decayed organic materials have a tendency to stick together and when applied to a loose sandy soil may improve its tilth. Excessive quantities of fresh organic manures may loosen some soils excessively and in this way be injurious.

Organic matter absorbs large volumes of water and hence increases a soil's water holding capacity. It also makes drainage possible. Water when applied to a soil containing abundant organic material readily distributes itself throughout the soil, whereas the same soil devoid of organic ma-

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terial does not manifest this property to an appreciable extent.

Organic matter is the great reservoir in which is held the nitrogen of the soil and considerable of the phosphorus and potassium. The plant residues which reach the soil carry nitrogen, phosphorus, and potassium in organic forms. As bacteria decompose the organic matter they liberate plant nutrients. Moreover, as the minerals are rendered soluble they are taken up by other plants or built over into other compounds by bacteria. Hence these essential elements are constantly passing from the soluble to the insoluble and back again. Were this not the case even greater quantities of plant food would be leached from the soil. The speed with which this transformation occurs depends upon the organic matter of the soil.

As the organic materials of the soil decay there are produced various acids which react with insoluble plant nutrients and render them available. Many economic systems of permanent soil fertility are based on the following: Plant nutrients are added to the soil in cheap forms or those already in the soil in an insoluble form are rendered available as needed by keeping the soil well supplied with plant residues and organic manure. A ton of manure is worth far more than its nitrogen, phosphorus and potassium. It may render available as it decays considerably more plant food than it carries. The fresh organic materials and not the old decayed materials are of greater value in this respect.

The heterotrophic micro-organisms of the soil require organic carbon for growth and metabolic activities. They may use it for building material, energy, or as accessory growth substances but in most cases the kind and quality of organic material in the medium are the factors governing their activities.

Loose soils, low in organic material are readily eroded by wind and water. Organic material enables the surface to absorb and retain more of the water. It also has a granulating effect upon the soil reducing the tendency to run together, hence keeps the soil open so there is less runoff and less erosion.

The increase in nitrogen resulting from a readily available supply of organic material is appreciable in some soils. Greaves and Nelson found that one acre-foot of the Greenville unirrigated fallow soil which had received yearly for 11 years five tons of barnyard manure gained 486 pounds of nitrogen or 44 pounds per acre annually over that supplied in the manure.

Soil micro-organisms also play another part which is of special importance in our western soils

which are often high in insoluble phosphorus. The micro-organisms may either directly render the phosphorus of the soil more soluble or they may build it over into their bodies. The phosphorus, on the death of the organism, would be returned to the soil in a readily available form. Fifty per cent of the nitrogen of Azotobacter, bacteria which live free in the soil and transform atmospheric nitrogen, is changed within six weeks, so it can be used by plants and there is every reason for believing that the phosphorus would be liberated just as readily.

Moreover, many soil organisms produce nitrous, nitric, suphuric, formic, acetic, lactic, butyric, and other acids, the quantity and kind of each depending upon the specific organisms and upon the substance on which they are acting. These all come in contact with insoluble substances which may be rendered soluble. They have a high solvent power for the insoluble phosphates. The resulting salts of calcium would be further attacked by bacteria with the formation of calcium carbonate.

Whether these processes give rise to an increase in the water-soluble plant food of the soil depends upon the composition of the soil and whether the products of the breaking down process exceed the products of the building up reactions. However, we must not lose sight of the fact that, although many of the organic phosphorus constituents produced by the action of bacteria may not be soluble in pure water, they may be more available to the living plant than are the constituents from which they were at first derived. Moreover, there is abundant literature showing that the addition of organic matter to the soil often increases the phosphorus of the plants grown in it.

Cows Pay $1 An Hour

Records of the Polk county D.H.I.A. show quite a difference in the top herds and in the less efficient herds. Average production of the 5 top cows in the association was 7,502 pounds of milk, 393 pounds of fat. The lowest 5 cows averaged 4,949 pounds of milk, 246 pounds of butterfat for the year.

Feed cost was more for the top cows, $111 compared with $80, but the income above feed costs was higher, too. This was $156 a cow compared with $86. Feed cost for every 100 pounds of milk was more for the poorer cows, $1.62 compared with $1.48.

Figuring 150 hours of labor, the top cows returned a profit of $1.04 an hour, the poor cows 57 cents an hour.

Homogenization – The Milk Salesman

Condensed from Holstein-Friesian World

P. H. Tracy

Department of Dairy Husbandry, University of Illinois, Urbana, Ill.

One of the most important developments in the market milk industry has been the application of high-pressure homogenizing machines to the processing of market milk. Homogenized milk has been sold in certain Canadian and European markets for some time and its almost general adoption in the United States has been accomplished within the last 10 years. At first this milk was not accepted by some health officials. This skepticism of regulatory bodies likely was due to the insanitary condition of many of the homogenizers formerly used by the industry, as well as the association that the homogenizer once had with the manufacture of reconstituted milk and cream from butter and skimmilk, practices once frowned upon by most regular bodies.

Also, the industry in some cases was rather hesitant to introduce homogenized milk because of the wide departure of such a product from the cream layer-forming milk that has been the principal theme of advertising propaganda since the introduction of the glass milk bottle. The housewife has been taught to look upon the depth of the cream layer as the prime factor to be considered when choosing the source of her milk supply. Consequently, milk dealers have resorted to every possible means to keep the cream from compacting itself into too small a volume at the top of the milk bottle. Naturally, dealers who have placed a great deal of emphasis upon the cream layer hesitate to "do an about-face" and feature a type of milk that does not cream. However, progressive milk dealers everywhere are finding that the cream layer has lost its prestige as the housewives in general are more interested in the merits of homogenized milk than they ever were in the depth of the cream layer.

Homogenized milk has been studied at the University of Illinois for several years. At the present 100% of the milk bottled in the University Creamery is homogenized. Attempts to learn the reason for the popularity of homogenized milk amongst its

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users have revealed such reasons as:

1. Absence of cream adhering to bottle cap.
2. No mixing necessary.
3. Tastes richer.
4. Answers a large number of purposes.
5. Can be used on cereal and in coffee.
6. Easy to prepare for baby feeding.
7. The last glass is as good as the first.
8. No cream rises to top of glass standing in refrigerator.
9. There is no temptation to remove the cream.
10. There is no loss of cream in scum after boiling.
11. Feedings prepared for infants in advance do not have to be remixed when used.
12. Quicker to serve.
13. Makes better-flavored gravy and soup.
14. Improves the texture of many foods.
15. Youngsters refuse to drink any other kind of milk.
16. Makes fine milk drinks.
17. It makes good custards.
18. Children drink more of this milk.
19. Nipples on bottles do not stop up and baby gets proper proportion of fat.
20. When homogenized milk freezes it does not churn out as does the regular milk.

Fat rises in milk because it is lighter in weight than the surrounding serum. The speed at which it rises depends upon the extent to which the fat globules come together into clumps, the faster the milk creams. Properly homogenized milk does not cream, because the fat globules are reduced to such a small size that they do not readily respond to the force of gravity and they do not cluster. As a result the top portion of a bottle of such milk, even after 24 hours' standing without mixing, ordinarily will not increase more than about 2% over the test of the well-mixed sample.

It has also been found that the high pressure of homogenization greatly reduces the firmness of the curd coagulated by the addition of rennet or pepsin, producing what is called a soft curd. Soft curd milk is thought to be much more easily digested than regular milk and is particularly desirable for infant feeding. The curd tension of regular pasteurized milk varies. At the University Creamery the regular milk will test in the neighborhood of 60 grams, while the same milk properly homogenized will have a curd tension of 12-20 grams.

The curd tension of milk varies with the season, being the lowest in summer when the milk-solids-not-fat are lowest.

The degree of fat dispersion

and the extent of curd tension reduction increase as the pressure of homogenization is increased, but at a decreasing rate. To prevent rising of the fat, the milk should be homogenized at about 2,500 lbs. pressure. There is little to be gained by going above this pressure. The same is true in the case of curd tension, as the greatest effect of the pressure upon curd tension is obtained before the 2,500-lb. pressure has been reached. While pressures higher than 2,500 lbs. will produce a richer tasting milk, it also causes a noticeable puckeryness in the milk.

One of the first problems experienced in connection with homogenized milk was its relatively poorer keeping quality. Several hundred comparisons of the bacterial counts of regular and homogenized milk will usually run somewhat higher than that of the regular milk. The difference is due to the breaking up of the bacterial clumps by the homogenizer, thus causing an apparent increase in numbers as determined by the plate count, as well as a bacterial pickup from the machine itself.

Differences in bacterial counts obtained on regular and homogenized milk are given in Table 1. The monthly values are averages of daily counts. In each case the regular and homogenized milks were from the same batch, the homogenized milk being processed after pasteurization at 143.5° F. The homogenizer used was one of the newer sanitary types of machines.

TABLE 1 — Bacterial Counts on Regular and Homogenized Milk

Month	Regular Milk	Homogenized
August	690	752
September	472	1,248
October	418	1,783
November	284	2,289
December	289	1,108
January	328	871
February	248	968
March	152	968
April	133	1,501
May	171	1,845
June	414	2,322
July	427	2,202

Little attention was given to the sanitary construction of homogenizers until homogenized milk came into prominence. Some of the early machines were so poor in sanitary construction that some health officials will not permit the milk to be homogenized after pasteurization. During recent years builders of homogenizers have endeavored to construct machines which can be quickly and easily disassembled for washing and sterilizing. In the old machines much of the bacterial contamination of homogenized milk has come from the piston packing. Therefore the required amount of packing has been reduced to a minimum in

the modern machines and it is now possible to remove the pistons for cleaning and sterilizing.

There has been some reaction against homogenized milk because of the sediment that sometimes appears in it. This sediment is a fine, dark grey deposit that slowly settles to the bottom of the bottle. It cannot be filtered out as it passes through the filter pad. This sediment is composed largely of body cells and protein material that normally is carried to the top of the bottle with the cream. The presence of a perceptible amount of this sediment in the milk is an indication that an appreciable amount of the milk is from cows having udder disturbances. The cure, therefore, should start with the herds. Milk from mastitis-free animals is not likely to cause much trouble in this respect. Sediment can be controlled to some extent by the use of a clarifier. Clarification is most effective when it takes place after homogenization. However, clarification after homogenization may result in a separation of small amounts of butterfat which will appear as a cream plug in the bottled milk. For this reason clarification before homogenization is to be preferred unless the amount of all material in the milk is excessive.

Experiments have shown that when homogenized milk is exposed to sunlight it will rapidly acquire a burnt taste. Although the flavor of regular milk is affected in the same way, the reaction is much faster in the case of the homogenized milk. Precautions should be encouraged. Milk is less affected by sunlight in paper bottles than it is in glass.

Testing Homogenized Milk

Comparative tests of regular and homogenized milk have shown the latter to be more difficult to test satisfactorily by the Babcock method because of the tendency for charred and greyish material to accumulate in the fat column. Some laboratories report a tendency for the homogenized milk to test slightly lower (.1%) than the regular milk. Best results are obtained when the acid used is reduced to about 17cc. and is added in three portions, shaking well after each addition. The acid should be about 72° F. and the milk 50-55° F.

Quality control is probably more important in the marketing of homogenized milk than in the case of other types of dairy products. The important selling points of homogenized milk are its low curd tension, non creaming features, and superior flavor. Dealers who fail to process their milk in such a way as to properly provide for these three factors will create a situation that will react unfavorably for the homogenized milk cause in general. Off-flavors due

to insanitary conditions of the homogenizer, homogenization of raw milk, or exposing homogenized milk to sunlight must be avoided. Low homogenizing pressures should not be used as the mere destruction of the cream line is not sufficient. The milk must be subjected to sufficient pressure to destroy practically all fat rising tendencies for at least 24 hours. The curd tension should be reduced to the minimum obtainable without resorting to an excessive heat treatment. The formation of cream plug should be avoided by taking care that unhomogenized milk is not mixed with the homogenized milk. The occurrence of sediment should be prevented by clarification of the milk and by controlling udder disturbances in the herds supplying the dairy.

Salt Increases Beet Yield

Condensed from New England Homestead

THE use of common stock salt on beets has resulted in substantial increases in yield in tests conducted by canning crop specialists at the State Experiment Station at Geneva, New York.

Reporting on studies on the correction of nutritional deficiencies of vegetable canning crops, the Station specialists cite the benefits obtained from applications of salt to correct apparent sodium deficiencies for growing beets on three farms of different fertility levels.

On one farm, 1½ tons of ground limestone, 12 tons of manure, 1500 pounds of a 5-10-5 fertilizer, and 500 pounds of stock salt to the acre were all plowed under together in preparing the land for beets. The acre yield was 23½ tons of beets as compared with 20.6 tons from the same treatment without the salt. The treatments were replicated four times, and it is believed that the 3-ton gain is significant.

On another farm, the field received 400 pounds of 5-10-5 fertilizer to the acre and on part of the field 400 pounds of salt per acre were drilled just before planting to beets. The area without salt yielded at the rate of about 12⅔ tons to the acre and that receiving salt at the rate of 18⅔ tons. Also, the seed germinated two days earlier on the salt-treated block, possibly because the salt attracted moisture.

On a third field, 450 pounds of a 5-10-5 fertilizer were used plus a side-dressing of 100 pounds of ammonium sulfate six weeks after the beets were planted. Four weeks later the field was side-dressed with 700 pounds of stock salt to the acre. The yield from the area receiving the salt was 22½ tons to the acre and that from area without salt 21.8 tons. The difference in this case is not regarded as significant, but it is thought that the salt was applied too late for maximum results. "In every test where salt was applied as a soil amendment for beets," conclude the Station scientists, "the foliage was larger and greener , indicating a deficiency of sodium in these soils for growing beets."

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Calf Weight Studies

Condensed from Shorthorn World

THE results of fifteen years' investigations of factors influencing bovine birth and weaning weights at the Range Livestock Experimental Station, Miles, Montana, emphasize the economic importance of those characters in which Shorthorns always have excelled other beef and beef and milk breeds. They explain the generally satisfactory results obtained from the temporary use in range herds of other beef breeds on cows possessing Shorthorn blood and it justifies experimentally the maintaining cows of such pronounced Shorthorn characteristics as scale, abdominal capacity and strong milk producing tendencies.

In these studies, nineteen per cent of the variation in birth weight was shown to be due to the influence of the dam and ten per cent to that of the sire. Twenty per cent of the weaning weight was found to be due to the dam's influence, and fourteen per cent to the sire's.

The size of the dam was shown to influence birth weight and weaning weight. Larger cows which possess greater abdominal capacity produce the biggest calves. The size of the cow was found to be of greater importance than changes in condition of fleshing. Weaning weight of calves raised on their dams is more important than birth weight and in this milk production naturally was a major factor.

The birth weight of calves was heaviest from four-year-old cows, declining each year until the dam passed the eleventh year. The smallest birth weight was from two-year-old heifers, while calves from three-year-old heifers averaged in weight practically the same as those from five-year-old cows. In these tests, the heaviest calves at weaning time came from six-year-old cows. From that age on, the average weaning weight declined steadily, with the calves from ten-year-old cows weighing on the average about the same as those from two-year-old heifers.

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FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.00.

America's Garden Book—By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons. $3.50.

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford Univ. Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.00.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $3.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.00.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. By R. W. Gregory. J. B. Lippincott Co. $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Farmers of the World—The Development of Agri. Extension—edited by Edmund deS. Brunner, I. T. Sanders, Douglas Ensminger. Columbia Univ. Press (1945). $2.50.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

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Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.00.

Grow Your Own Fruit — By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Greenberg, Publisher. $3.50.

Growing Tree and Small Fruits—By H. B. Knapp, Director, State Institute of Applied Agriculture, Farmingdale, Long Island, N. Y., and E. C. Auchter, Chief, Bureau of Plant Industry, U. S. D. A. John Wiley & Sons. $2.75.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

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Livestock Judging Handbook — By Julius E. Norby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The interstate Printers. $2.60.

Natural Principles of Land Use—By Edward H. Graham, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

Pay Dirt—Farming and Gardening with Composts — By J. I. Rodale. Devin-Adair Co. (1945). $3.00.

Palestine—Land of Promise — By Walter Clay Loudermilk, assistant chief of the Soil Conservation Service. Harper and Brothers (1945) $2.50.

Pleasant Valley — By Louis Bromfield, author, farmer, soil conservationist. Harper and Brothers. $3.00.

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The American Land — Its History and Its Uses — By William R. Van Dersal, biologist in the U. S. D. A. Oxford University Press. $3.75.

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.00.

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Weeds of Lawn and Garden — By John M. Fogg, Jr., Prof. of Botany, Univ. of Penna. University of Pennsylvania Press (1945). $2.50.

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Soils and Men—1938 Yearbook of the United States Department of Agriculture—$1.75

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